

Planning and Zoning: Site Plan Production Guidance



**Prepared by
The Department of Planning and Zoning**

May 2015

Site Plan Production Guidance

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Note: Although every attempt was made to make this guidebook complete and thorough, accuracy and comprehensiveness cannot be guaranteed. Applicants should always refer to the authority under which the review or permitting process was established. In all cases, where requirements differ, the more stringent policy applies.

Site Analysis

- **Producing a Plan**
- **Examples of Plans**

The objective of site analysis is to methodically evaluate a site in order to foster wise design decisions and prevent unnecessary design pitfalls. Site analysis arises out of asking questions, specifically questions about natural features and patterns, human influences, built structures and patterns of use of the site and the surrounding area.

With accurate data from observations and research, the process of uncovering potential conflicts and discovering intersections of conditions suitable for design opportunities becomes easier and more reliable. While good design can be hampered by oversights, it can be enhanced by a thorough understanding of the site and its potential.

This manual addresses key aspects of site analysis and site plan production. This includes the following topics:

- Tree Preservation
- Water Quality and Quantity
- Grading and Erosion Control Measures
- Soil Management
- Pedestrian and Vehicular Circulation
- Bufferyards and Screening
- Planting
- Utilities and Service Areas
- Lighting
- Streetscape Elements and Site Furnishing

Each topic begins with a general overview and with an introduction to core principles for each topic. The

components of each topic are then discussed with specific requirements, things to consider, and sample detail drawings.

Producing a Plan

From the beginning of a site plan production process there are principles and requirements to consider. A good design depends on good upfront data collection and a thorough understanding of existing site conditions.

Principles

- 1) Because understanding existing conditions sets the foundation for quality design, complete and accurate data gathering is essential. If data is thoroughly recorded it only needs to be gathered once; then it is available for reference later.
- 2) Understanding the existing site conditions leads to well informed design decisions. With a solid understanding of conditions and patterns related to the site, the design can optimize a site's potential and avoid possible conflicts.

Requirements, as Applicable

- 1) Visit the site and record existing conditions through text, mapping and photographs. Use the topics below as a guide.
- 2) Perform document research related to the site including natural resources, natural resource protection, history and cultural resources.
- 3) Perform/contract a professional survey including property lines, topography, site appurtenances, physical features, woods and edges, trees over 4" caliper, mean high water, and wetland boundaries with horizontal limits and vertical

- elevations.
- 4) Record topography including:
 - Slope and variation
 - Elevation above sea level
 - Existing drainage patterns
 - 5) Evaluate soil type and condition (see the below sections **Tree Preservation, Soil Management, and Planting Guidelines** for soil testing information) including:
 - Soil contamination
 - Mineral or clay soil
 - Saturated or dry soil (check topography, hydrology and climate to determine seasonal moisture regime)
 - Biological life present in soil
 - Compaction
 - pH
 - Erodibility (K-factor)
 - 6) Record hydrologic resources including:
 - Groundwater levels and flow direction
 - Bodies of water and location
 - Tidal vs. non-tidal waters
 - Floodplains as determined by FEMA and City Code Section 17.08.150 Floodplain
 - Wetlands status
 - Human alterations to hydrology
 - 7) Record vegetation as explained below (refer to City Code Section 14.12.095 Tree Conservation Areas—Tree Removal):
 - Tree stands
 - Individual trees >4" caliper
 - Shrubs >5'-0" in height or spread
 - Specimen trees/plants (trees >= 28" caliper)
 - Native plants
 - Invasive plants
 - Microclimates (created by buildings, topography, water bodies, vegetation, etc.)
 - 8) Record other natural features such as:
 - Shade or sun conditions
 - Rock/mineral outcroppings or surface features
 - Orientation for daily and seasonal sun exposure
 - Prevailing winds with seasonal changes
 - Views to and from the site
 - Existing and potential pollution and sources
 - 9) Assess the built environment including:
 - Ratio of building to property area
 - Property markers (fences, walls)
 - Paving and other impervious surfaces
 - Utility locations, including surface, overhead, underground
 - Zoning
 - Circulation patterns
 - Travelways (vehicular, bicycle, pedestrian) and remnants of paths
 - 10) Indicate the context from surrounding area. Refer to City Code Section 21.62.020 General Design Standards. Consider the following:
 - Development density
 - Neighborhood character
 - Zoning
 - Architectural style
 - Scenic or historic features and landmarks (see City Code Section 21.62.060 Scenic, Historic, Archaeological and Landmark Sites and Views)
 - Ratio of buildings to lots on adjacent properties
 - Buildings width and height

- Building setbacks
- Parking availability
- Orientation on lots
- Vegetation type and location

11) Indicate zoning including:

- Zoning of property and adjacent properties
- Zoning variation in area
- Fence, wall and property line regulations
- Historic district or neighborhood zoning regulations
- All applicable setbacks

12) Identify opportunities and constraints including:

- Search for and record opportunities such as a stream that runs through the site or a historic building or a majestic tree
- Search for and record constraints such as utility locations or slope or poorly draining soils

Things to Consider

Consider the following examples of opportunities and constraints (sometimes both found in one feature) and record these and other issues that are relevant for the project site:

- 1) The load bearing capacity of soil determines building potential
- 2) A natural body of water such as a creek limits the locations for buildings, but offers an opportunity to highlight a natural feature in the design
- 3) Existing buildings determine the area and location available for possible added features
- 4) The presence of invasive species requires greater future maintenance, but also indicates that the soil is viable for planting (there may still be limitations)

- 5) The orientation of buildings to the sun will create micro-climates, some of which may be sunny and beneficial for planting and others with shade that create other planting options
- 6) Generous tree cover on a site offers natural shade and cooling for buildings and exterior spaces
- 7) Vegetated buffers along steep slopes and streams can provide for walking paths and nature walks.

Examples of Plans

Site development applications should include the information listed below, as applicable and as described by plan type:

Existing Conditions Plan

- 1) Location, general type and quality of existing vegetation, and specimen trees
- 2) Property lines and easements
- 3) Zoning and use of all abutting properties, location of buildings on abutting properties within 50 feet of property line, and notes indicating the existence of all buildings on abutting properties between 50 and 200 feet of property line; zoning and use of properties directly across any collector, primary, or secondary street adjacent to the subject property
- 4) Name, location, and right-of-way and paving widths of all abutting streets
- 5) Natural features such as ponds, lakes and streams
- 6) Delineation of regulated environmental features such as 100-year floodplain, regulated streams, wetlands and their associated buffers

- 7) Location, height, dimensions, and use of all existing buildings and other structures (including parking lots, sidewalks, and other paved areas; fences and walls; and recreational equipment)
- 8) Existing topography grading in two foot contours
- 9) Location of existing utilities and utility easements, including water, storm drain, and sanitary sewer pipes; overhead wires; utility poles and boxes; and signs

Site and Architectural Context Plan

The requirement to provide a Context Plan is made on a case by case basis during the preliminary review stage with the Department of Planning and Zoning.

The Context Plan will need to address the relationship of the new development to its surrounding environment and encompass an area within 300 hundred feet radius of the new development

Evaluate each block for a series of quantifiable statistics such as:

- 1) On residential streets, evaluate streetscape elements, urban density building setbacks and the space between buildings. Urban density for residential streets represents the amount of linear building face per 100 linear feet of street
- 2) On commercial streets evaluate streetscape elements, building setback, building use, building height, bulk and scale
- 3) Evaluate material and facade treatment for both zoning or use types

Tree Preservation and Tree Removal Plan

- 1) Existing vegetation to be saved(indicated and noted accurately)
- 2) Existing trees 6 inches in caliper or greater to be surveyed for location and topographic information
- 3) Methods and details for protection of existing vegetation during construction; (see Supplemental Development Guidance section "Tree Preservation") and the approved sediment control plan, if available
- 4) Limit of disturbance line
- 5) Existing trees and vegetation to be removed

Planting Soil Preservation and Improvement Plan

- 1) Soil testing results or summary
- 2) Existing soil analysis diagram. Show four soil condition types including undisturbed, disturbed but suitable for supporting plants, disturbed but could support plants with remediation, and unsuitable for plants
- 3) Soil preservation and improvement diagram showing undisturbed, protected areas; grading; topsoil removal; topsoil stockpiling; limits of soil treatments
- 4) Sections of soil improvements

Grading Plan

- 1) Location, height, dimensions, and use of all existing and proposed buildings and other structures (including parking lots, sidewalks, and other paved areas; lighting, fences and walls; and recreational equipment)
- 2) Show existing contours
- 3) Proposed grading in two foot contours, with any slope steeper

than 3:1 labeled; for slopes less than 3:1 use one foot contours; for surfaces 5% or less use 0.25 foot contours

- 4) Show spot grades at all corners, high points, low points, walls, curbs, ramps, steps, drainage structures, and critical information points
- 5) Location of existing and proposed utilities and utility easements, including water, storm drain, and sanitary sewer pipes; overhead wires; utility poles and boxes; lighting and signs
- 6) Stormwater management plan including existing and proposed stormwater management features. See City Code Section 17.10.080 Stormwater Management Criteria.
- 7) Erosion and Sediment Control Plan. See City Code Section 17.08.030 Grading Permit—Required Application.

Hardscape Plan

- 1) Location and description of other site improvements, such as earth berms, walls, fences, screens, sculptures, fountains, street furniture, lights and courts or paved areas
- 2) Required buffer yard depths/widths (i.e., building setbacks from all lot lines)
- 3) Symbols for existing trees to remain and proposed trees

Planting Plan

- 1) Locations and labels of all proposed plants using standard landscape architectural graphic conventions portraying plant spreads at 30 feet for shade trees, 10 feet for evergreen trees and 15 to 20 feet for ornamental trees

- 2) Plant list or schedule to include botanical and common name, quantity, spacing and size at time of planting of all proposed plants
- 3) Planting installation details as necessary to insure conformance with the standards of this Manual
- 4) Schedules or lists showing required and proposed quantities for items called for by this Manual
- 5) Specifications for soil mixture in which plant materials are proposed to be planted, and/or amendments proposed to native soils in planting areas
- 6) Required buffer yard depths/widths (i.e., building setbacks from all lot lines)
- 7) Site development plans should include planting schedules selected from those shown in Appendices to document required and proposed quantities and sizes for all items required by this manual
- 8) Maintenance Plan shall be prepared describing the care and feeding of the plant material through a two years establishment period

Tree Preservation

- **Aeration and Compaction**
- **Tree Protection Fencing**
- **Root and Crown Pruning**
- **Fertilization and Remedial Treatment**

The objective of tree preservation is to protect and enhance existing natural vegetation resources. Existing vegetation is established, and individual plants are integrated with the existing soils and surrounding plants. Planting and establishing a young nursery tree takes years and the benefits of that small tree cannot be equated with the benefits gained from a mature tree. In terms of the most common benefits – shade, cooling, CO₂ absorption, windbreak, screening, and wildlife habitat – larger existing trees offer more. Therefore, preserving existing vegetation, along with its inherent benefits, shows quicker gains (instant) for the site and project than does planting smaller nursery stock.

Preservation of existing vegetation includes identifying healthy trees and vegetation stands, identifying potentially damaging conditions, identifying necessary remedial actions and, during construction, protecting trees and other vegetation that are intended for preservation. See City Code Section 17.09.030 Landscape Plan and Section 21.62.040 Planting for guidance on selecting existing trees for preservation efforts.

Urban situations present challenging conditions for existing trees—from previous soil replacement (or

disturbance) and limited root space to climatic stressors and neglect.

Additionally, construction potentially endangers trees through disturbance of soil, roots, and hydrologic patterns.

The opportunities related to tree preservation include creating design features, such as protecting a healthy wooded area or highlighting specimen trees as focal features. Preserving high quality vegetation and enhancing or improving stressful conditions for lower quality vegetation will also improve conditions for new plantings.

Furthermore, preserving existing trees as focal features lends a maturity to the landscape of a newly developed or redeveloped site that a cleared site will likely not achieve for decades. In general, successful tree preservation reduces the potential negative impacts and maximizes conditions for vigor of the trees in the newly created landscape.

Considering the larger scale of the City of Annapolis, tree preservation helps to maintain the landscape context of neighborhoods, including ties to history. Tree preservation addresses the goal of no-net loss for tree canopy, in light of the 50% tree canopy cover by 2030.

Guidance related to tree preservation relates to the goals of sustainability, water conservation, context, livability and cost-effectiveness.

Principles

- 1) Aeration and minimizing compaction increases trees' chances of survival during and after construction activities and enhances the soil's ability to convey groundwater.

- 2) Tree protection needs to correspond to the potential damage. Where heavy equipment use is anticipated, unintentional damage is more likely. Standard tree protection will not perform well.
- 3) Maintaining the biological functions of the tree and reducing stress related to disturbance will prolong the life of a tree and reduce the chance of loss due to disturbance.
- 4) Maintaining moisture within the root zone will minimize shock and stress to the tree.
- 5) Avoiding and/or minimizing root compaction will minimize damage to roots and will enable air and water to remain within the root zone.
- 6) Preservation (as opposed to replacement) of a mature healthy tree maintains the environmental function of the tree (e.g. air quality, cooling). A young tree will need years to mature before it provides the same environmental benefits.
- 7) Soil testing assesses the quality of existing soil and provides a baseline from which recommendations for fertilization and remedial treatments may be derived to restore the soil and prepare it for planting.
- 8) Compost improves drainage as well as moisture retention capacity (depending on soil type) while also providing nutrients and contributing to the soil food web. Because it reuses waste it also reduces the need for landfill space.



Aeration and Compaction

Compaction (or over-compaction) of the root zone is a common problem for trees in urban conditions. Compaction may be present prior to construction or caused by construction. Aeration can provide more air space and thus oxygenation within the root zone to reduce negative impacts of construction.

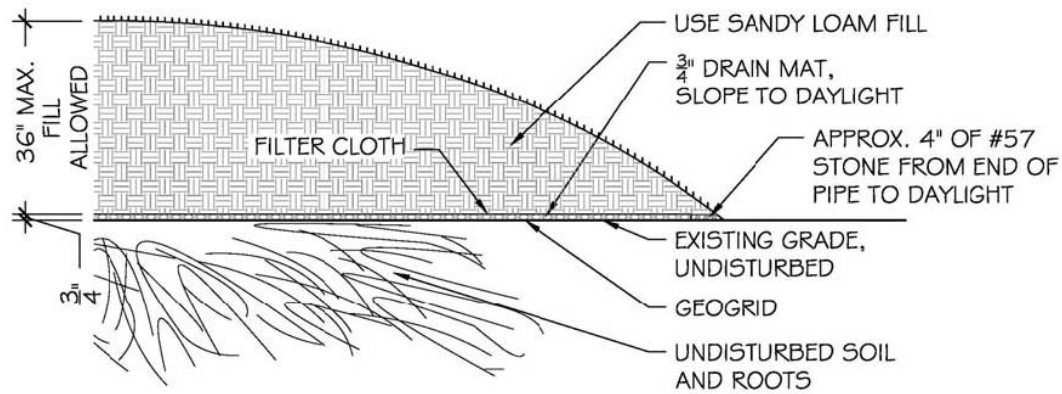
Requirements, as Applicable

- 1) Aerating around trees may damage root systems; aeration must be carefully performed by a Certified Arborist to minimize potential damage.
- 2) In zones where paving is required, minimize compaction and maintain aeration by installing permeable paving above the existing root zone. To maintain drainage use a gravel base with no fines.
- 3) Do not perform compaction remediation work if soil is too dry (near wilt point) or too wet (at or above field capacity).
- 4) Aerate the tree roots by radial trenching (between roots) using an air spade to minimize damage or by vertical mulching, which entails

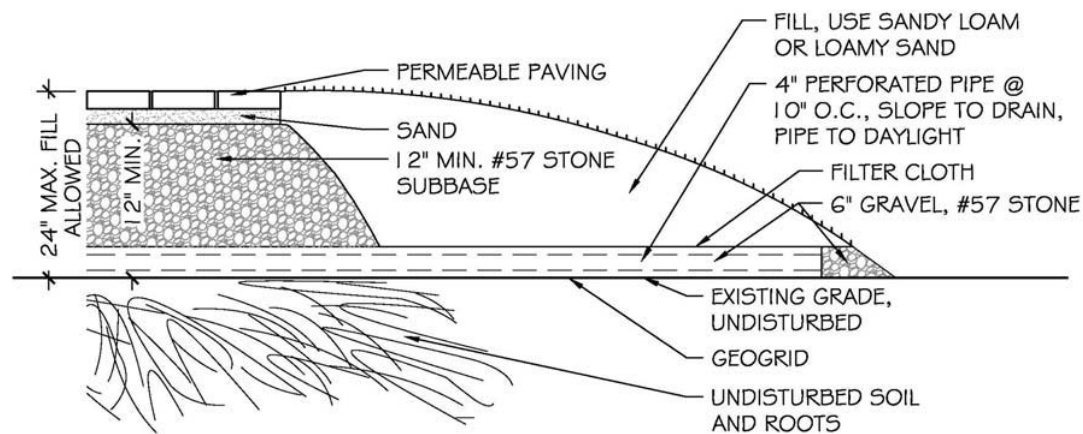
drilling holes in a radial pattern or air spade root invigoration. Air spade root invigoration: break soil compaction to depth of compaction or 9". Add 3" compost and work into loosened soil.

- 5) Refill trenches or holes with compost or 50/50 mix of compost and gravel.
- 6) For areas with compaction prior to construction, perform compaction remediation prior to the start of work. For compaction created during construction, perform remediation as soon after compaction as possible
- 7) Immediately after compaction remediation work is completed apply 1" of water over soil and apply mulch and geo-textile as indicated in the **Fertilization and Remedial Treatment** Section.

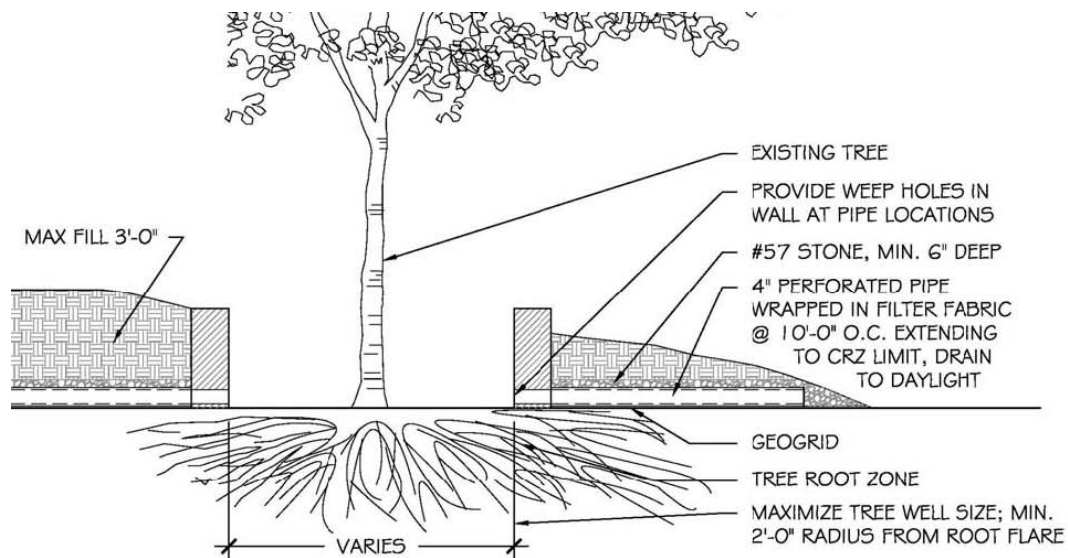
Details



Section of Fill in CRZ (no cut allowed)



Section of Paving in CRZ (no cut allowed)



Fill with Tree Well

Tree Protection Fencing

In order to protect existing trees during construction, fencing shall be installed for the duration of all construction activities.

Requirements, as Applicable

- 1) Establish the critical root zone (CRZ) as the target area for treatment. Multiply the diameter of the tree at breast height (DBH) in inches by 1.5. Use the product as radius (in feet) for the CRZ.
- 2) Use chain link fencing for all commercial multi-family housing and subdivisions of more than three houses. Plastic fencing for single family houses and subdivisions of three or fewer homes may be allowed in some instances.
- 3) Install fencing prior to starting work, and maintain until all work is complete, including plant installation.
- 4) Do not move the fence or enter fenced area without prior approval of the Department of Neighborhood and Environmental Programs (DNEP). See City Code Section 17.09.050 Protection of Trees during Construction and 17.09.120 Landscaping Plans— Approvals— Inspections.
- 5) Protect trees within the limits of disturbance and 15' outside of the limits of disturbance where trees are impacted by construction activities. See City Code Section 17.09.040 Protection of Trees before Construction.
- 6) Set fencing at the limits of the critical root zone (CRZ) and modify location of fence line as necessary to respond to specific conditions. See City Code Section 17.09.040 Protection of Trees before

Construction.

- 7) Erect fence around groups of trees where possible.
- 8) Place 8" x 10" signs identifying protection zone every 50' on fencing (never on trees).
- 9) Do not store materials and/or equipment or discharge liquids within designated CRZ.



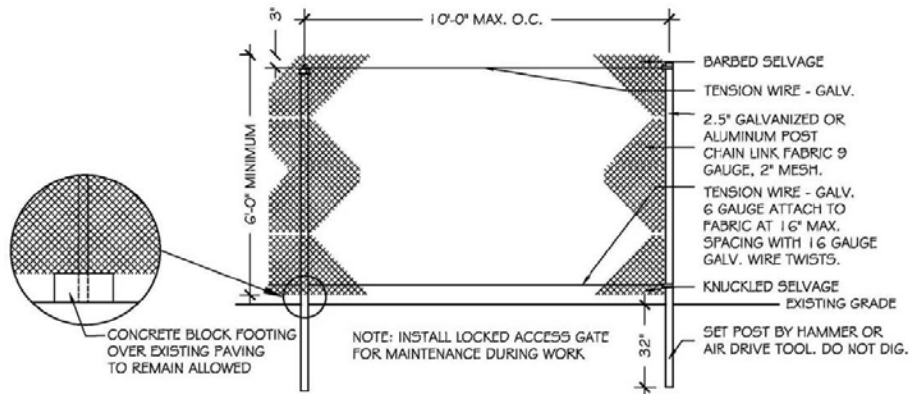
Photo credit: Jim Urban



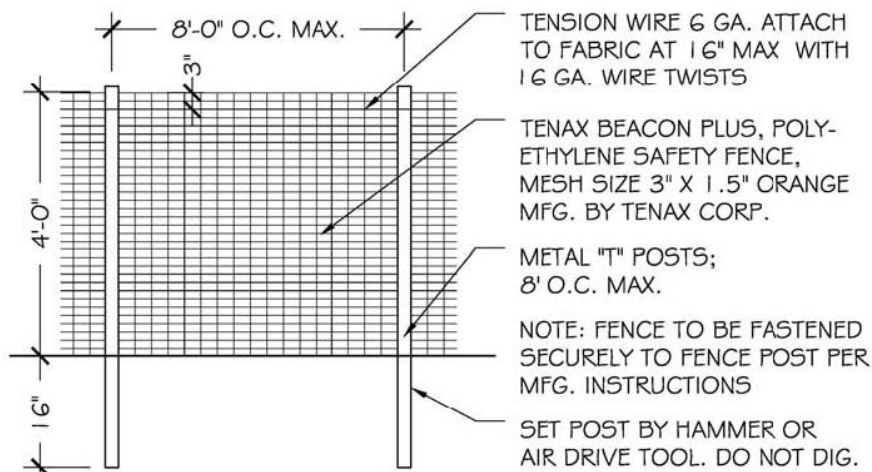
Things to Consider

- 1) Reuse or rental of tree protection fencing and materials reduces capital expenses.
- 2) Use limit of disturbance fencing or silt fencing as tree protection fencing when possible.

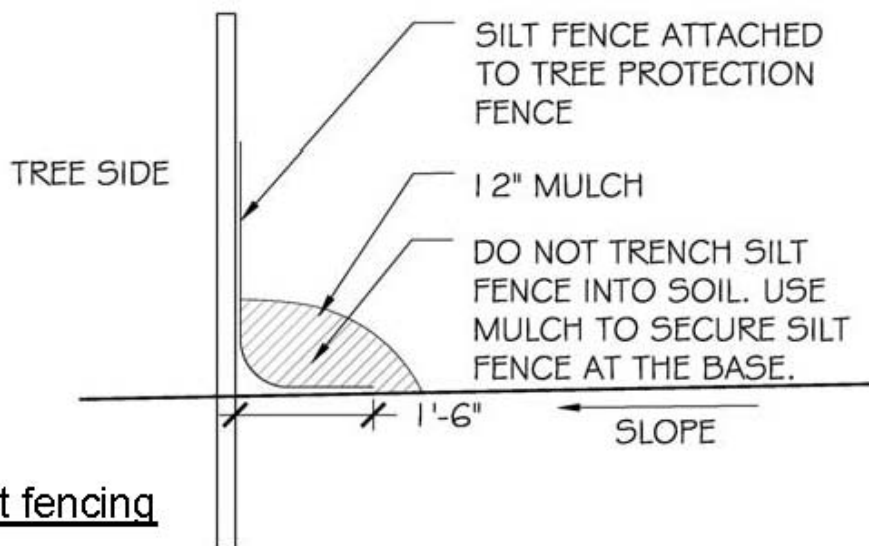
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Chain Link Fence



Plastic Fencing



Silt fencing

Root and Crown Pruning

Root pruning is a proactive measure to improve the chance of survival for trees in construction areas.

Requirements, as Applicable

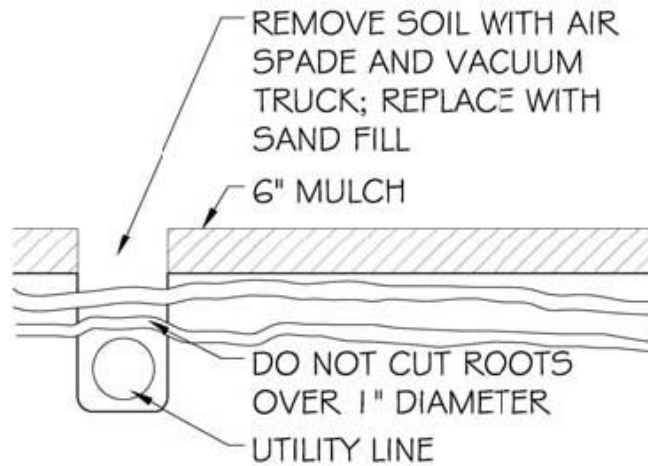
- 1) Establish the critical root zone (CRZ) as the target area for treatment.
- 2) Multiply the diameter of the tree at breast height (DBH) in inches by 1.5.
- 3) Use the product as radius (in feet) for the CRZ.
- 4) Minimize root disturbance and maximize protection of the critical root zone. Fence limits of critical root zone (CRZ). (See the Tree Protection Fencing section.) See City Code Section 17.09.050 Protection of Trees during Construction and 17.09.060 Protection of Trees after Construction.
- 5) Adjust CRZ to reflect areas where roots are not likely—for instance, building foundations and road beds.
- 6) Apply water to the CRZ as described in the **Fertilization and Remedial Treatment** section.
- 7) Contract a Certified Arborist to design and oversee all pruning work.
- 8) Perform pruning according to American National Standards Institute (ANSI) A300 Standards for Tree Care Operations - Part 1-2008 - Pruning.
- 9) Prune roots at the limits of the CRZ.
- 10) Root and crown pruning shall be done as soon as possible after permit approval.
- 11) In the case of transplanting, root pruning shall be done a minimum of 60 to 90 days before initial digging.



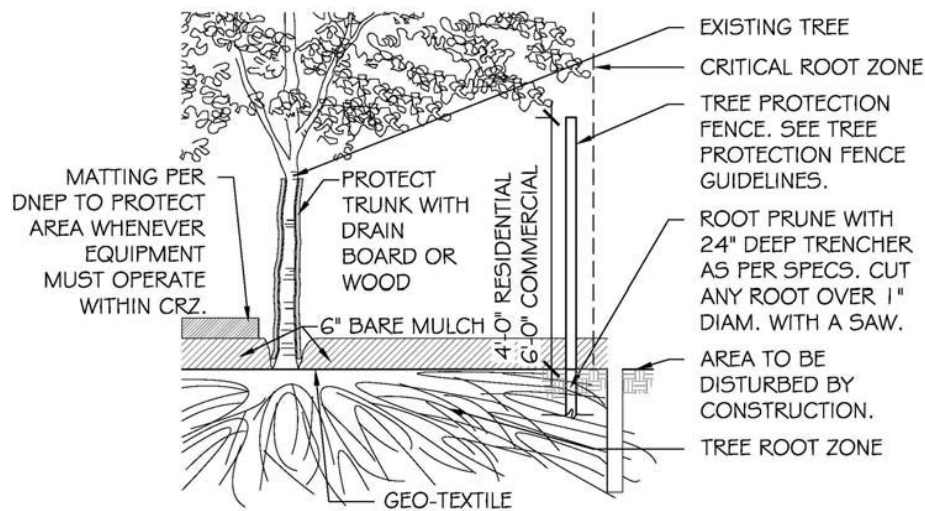
Photo credit: Jim Urban

- 12) Cover soil within CRZ with 6" mulch and geotextile. Cover mulch with matting in any areas where vehicles must enter CRZ. (See the Tree Protection Fencing section.)
- 13) Use sharpened tools (preferably a trencher) for cutting roots. Do not break or tear roots or branches. Do not leave ragged ends.
- 14) Use an air spade (or equal) for all digging within the root zone. Do not cut roots over 1 ½" in diameter.
- 15) Monitor trees for insects and disease and treat all issues. Provide disease and insect control strategies for all preserved trees during construction and for two years thereafter.
- 16) Avoid additional disturbance to the root zone. If disturbance within the root zone is necessary, the Department of Neighborhood and Environmental Programs must approve extents and methods. Root prune or air spade prior to disturbance.

Details



Utility Work in CRZ



NOTE: REMOVE GEO-TEXTILE AND MULCH AT THE END OF THE PROJECT

Root Pruning

Fertilization and Remedial Treatment

Fertilization and remedial treatment increase the chance of survival for existing trees that have been designated for preservation and are impacted by construction.

Requirements, as Applicable

- 1) Where roots are damaged or root pruning is significant, use a growth regulator to discourage foliage growth and promote root growth to reduce stress on the tree.
- 2) Undertake all required soil amendment work and growth regulator application as soon as possible after permit is issued.
- 3) Where indicated by soil test, apply fertilizer. Refer to American National Standards Institute - A300 Standards for Tree Care Operations - Part 22004 – Fertilization.
- 4) Where indicated by soil test, address compaction issues according to Aeration and Compaction.
- 5) In areas not already covered by lawn or paving scarify soil and apply 2" of compost prior to adding geo-textile and mulch.
- 6) Immediately after issue of permit apply 1" of water per week to all areas within the critical root zone (CRZ) between March 1 and November 15 unless 1" of rain falls during the previous week.
- 7) Amend if necessary to repair damage within CRZ. See 17.09.060 Protection of trees after construction.

Things to Consider

Application of compost tea increases microbial action. Determine need with testing (bioassay).

Water Quality and Quantity

- **Rainwater and Condensate Harvesting and Storage**
- **Bioretention, Microbioretention and Rain Gardens**
- **Regenerative Stormwater Conveyance**
- **Green Roofs**
- **Permeable Paving**
- **Vegetated Swales**
- **Detention and Retention Ponds**

The objective of the section on water quality and quantity is protecting natural hydrologic patterns and resources, including local creeks, the Chesapeake Bay and groundwater reserves. Corresponding objectives include protecting soil and landforms, promoting infiltration and restoring groundwater reserves. See City Code Section 17.10 Stormwater Management and 21.62.080 Surface Water Drainage.

The water quality requirement is treatment of the first inch of rainwater on site.

The City intends to manage rainwater where it falls as often as possible. In general, treating rainwater where it falls creates a dispersed pattern of smaller treatment areas. Dispersing treatment may reduce expense dedicated to large facilities while incorporating landscape amenities as aesthetic features as well as stormwater management tools.

The stormwater treatment methods described in this section are suggested approaches to meet the treatment

requirement. No single method listed herein is required, but the quantifiable treatment goals must be met according to State of Maryland and City of Annapolis requirements. The list of possible treatment methods is not exhaustive. The methods listed are common in stormwater management. Other methods may be used, and will be subject to approval by the City before construction. Documentation will be required. All proposed methods must meet the requirements and align with the City's intent for stormwater management. See City Code Chapter 17.10 Stormwater Management including 17.10.080 Stormwater Management Criteria and 17.10.090 Specific Design Criteria and Analytical Methods. Other methods are described in the Maryland Stormwater Design Manual. The Environmental Site Design section is particularly helpful. See the appendices for more information.

Because each site presents distinct opportunities and constraints, the same methods will not work equally well for each site. Designers will need to consider site conditions and select treatment methods appropriate for each site. The guidance available here, along with the Maryland Stormwater Design Manual and other resources, is intended to enable designers and engineers to tailor stormwater management to the needs of the site and clients.

This guidance does not supersede or negate state or federal regulations. Water quality and quantity guidance relates to all of the goals mentioned in the introductory chapter of the manual.

Principles

- 1) Rainwater use reduces the need for irrigation and the use of potable water, a diminishing resource.
- 2) Rain barrels and cisterns are simple and tangible tools for individuals and institutions to contribute to improving the environment.
- 3) Because rainwater harvesting is an easily understood method to benefit the environment, it serves as an example for environmental education.
- 4) Native plantings are good choices for rainwater irrigation because they are already adapted to the rain cycles of the local climate. Non-native adapted plants may also be appropriate. Avoid invasive plants.
- 5) Systems tend to be small, dispersed stormwater treatment near the source; however, larger scale applications may be appropriate where conditions allow.
- 6) The intent is to reduce water velocity, erosion and sediment transport and to promote infiltration.
- 7) The aesthetic character of Regenerative Stormwater Conveyance Systems may be a naturalistic series of boulder dams and pools or a more controlled, deliberate and constructed approach. Water quality will benefit from either style or design approach.
- 8) The life cost of a green roof proves to be economical. The life expectancy of a green roof surpasses that of a conventional roof, and costs are comparable when averaged over time. The longer life expectancy derives from the greater protection (from the elements and mechanical damage) of the waterproofing membrane by plants and growth medium. Additionally, a green roof will reduce energy costs and reduce the space and costs associated with stormwater management techniques.
- 9) Function, soils, water table elevation, drainage and topography determine design opportunities for grading and planting vegetated swales.
- 10) Vegetated swales offer functional and aesthetic improvements over swales lined with stone or concrete because of improved water quality and habitat created by the vegetation.

Rainwater and Condensate Harvesting and Storage

Rainwater harvesting is capturing rainwater where it falls. Condensate harvesting is collecting condensate from a cooling system for re-use. Harvested water may be used in the landscape to irrigate plants, increase infiltration and to recharge the aquifer. Storing the water reduces runoff volume and prolongs availability for irrigation.



Photo credit: Jim Urban

Photo credit: Jim Urban

Requirements, as Applicable

- 1) Harvested water shall be stored in basins or cisterns to be used for irrigation or other purposes.
- 2) Rainwater harvested from an impervious catchment such as a roof shall be filtered before storage. Filtration may be through a green roof system or other filtration mechanism.
- 3) Surface areas of soil-based harvesting storage areas shall incorporate secondary uses such as:
 - walkways,

- water features associated with treatment zones,
- seating beside gardens,
- decks over infiltration areas,
- allowances for lawn if lawn serves as an infiltration bed and has appropriate soils,
- areas for play during low water periods,
- filtration and tree root spaces under paving and parking,
- catchment areas under dumpsters and enclosures,

- 4) New commercial developments are required to harvest, store and reuse 25% of the first inch of rainfall on site.
- 5) New commercial developments are required to harvest, store and reuse all condensate water.
- 6) Cover long term storage basins to prevent mosquitoes from laying eggs on the water surface.
- 7) Rainwater and condensate harvesting systems shall be aesthetically pleasing as well as functional and code compliant. Refer to City Code Chapter 10.24 Standing Water, Section 17.28.045 Recycled Wastewater—Water Conservation, and 17.28.080 Permit—Required.

Things to Consider

- 1) Disconnect roof drains from the below-grade stormwater mechanical (piped) drainage system where feasible.
- 2) Draining aboveground rainwater storage containers during winter months is recommended.
- 3) Residential developments are encouraged to harvest and use rainwater. A maintenance plan is

required.

- 4) Permeable paving provides a complementary use.
- 5) Collecting runoff from a green roof system and storing it in a cistern for reuse is recommended,
- 6) Rainwater may be incorporated into non-potable household uses such as flushing toilets, but must be treated and plumbed appropriately in accordance with code

Bioretention, Microbioretention and Rain Gardens

Bioretention is a biomimetic approach to treating stormwater with plants, soils and microbes. The treated water is retained and then infiltrated or filtered and conveyed to a conventional stormwater system.

Rain gardens are bioretention areas designed for aesthetic as well as functional purposes. They may promote infiltration, filtration or both.



Photo credits: Jim Urban

Requirements, as Applicable

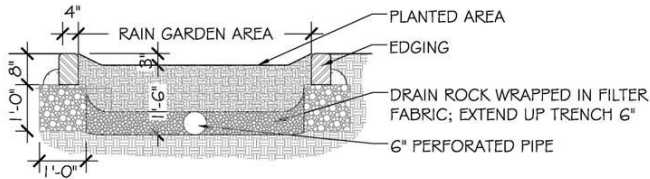
- 1) The drainage for any individual bioretention area or rain garden shall be 20,000 sf or less. See the Maryland Stormwater Design Manual, Chapter 5¹.
- 2) A bioretention area or rain garden shall be a minimum of 2% of the contributing drainage area.
- 3) Bioretention areas shall be designed to drain within 48 hours (no remaining standing water).
- 4) Tips for plant selection:
 - Select plants that are naturally tolerant of inundation for designed time periods.
 - Select plants that are tolerant of fluctuations between drought and inundation.
 - Select plants that tolerate high pollutant and nutrient exposure (specific to localized area).
 - See Anne Arundel County website – Rain Gardens² and Prince Georges County, Maryland -Bioretention Manual³.
- 1) Use in areas of well-drained soils or substitute an appropriate volume of soil mix or drainage media that is designed to maximize the system.
- 2) Consider the source of stormwater and pollutants in order to determine filtration needs (more filtration in areas with poor soils and higher pollutant loads).
- 3) Refer to City Code Section 17.10 Stormwater Management.

Things to Consider

- 1) Collect and treat stormwater from hardscape areas.
- 2) Direct parking lot runoff to vegetated bioretention areas internal to parking lots. Remove curbs or create curb

- cuts.
- 3) Slope walkways and patios into rain gardens or bioretention areas.
 - 4) Provide public demonstration areas to educate and encourage community participation.

Details



Rain Garden Section

Regenerative Stormwater Conveyance

A series of small check dams (or embankments) and pools slows down and filters water as it flows toward the Chesapeake Bay. This is the essence of the system, which takes on many forms from naturalistic and non-structural to structural. The series of flow barriers may be constructed with natural boulders, concrete or alternative check dam materials. The pools are associated depressions, vegetated swales or “micropools,” which allow sediment to settle.

Requirements, as Applicable

- 1) Sufficient land with appropriate soils to treat the volume of water must be available.
- 2) Slopes, as averaged over the designed flow path, shall be 5% or less.
- 3) Collaboration between civil engineers and landscape architects is required to integrate the technical and aesthetic aspects of this site feature.
- 4) Develop a maintenance plan,

complete with silt removal from the upstream side of check dams, equipment access, maintenance schedules, reviews and monitoring to adjust maintenance tasks as needed.

- 5) Work with natural and naturalistic systems to stabilize the channel and minimize negative impacts before employing engineered construction approaches.
- 6) Refer to:
 - City Code Section 17.10 Stormwater Management
 - Maryland Department of the Environment, Stormwater Design Manual, Chapter 5⁴
 - Step Pool Storm Conveyance⁵
 - Stormwater Manager’s Resource Center website – Step Pools⁶

Things to Consider

Increase wildlife habitat through carefully selecting associated planting near the water path or source.

Green Roofs

Green roofs are vegetated roof systems, consisting of growing media (mineral based soils) and plants, designed to detain rainwater and reduce the surge of stormwater runoff during a storm.



- Manual, Appendix A⁸
- Maryland Stormwater Design Manual, Appendix B.4⁹
- ASTM website¹⁰

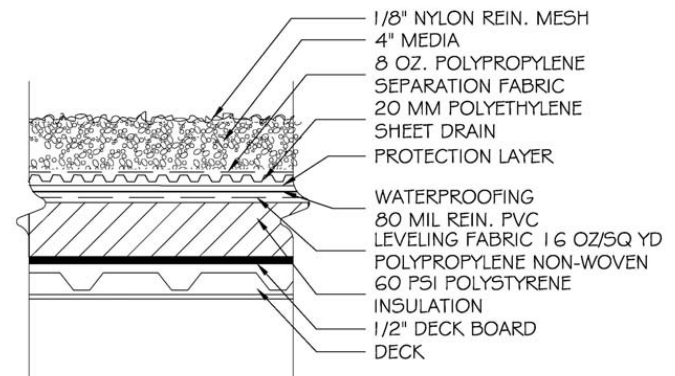
Things to Consider

- 1) Divert to irrigate a planting area at grade.
- 2) Capture water off a pervious roof area to increase rainwater capture.
- 3) Direct runoff from the green roof to a cistern for later irrigation.

Requirements, as Applicable

- 1) Meet or exceed Guideline for the Planning, Execution and Upkeep of Green Roof Sites (2004 English translation of Richtlinie für die Planung, Ausführung und Pflege von Dachbegrünungen) by The Landscaping and Landscape Development Research Society of Germany (Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau), commonly called FLL guidelines for green roofs.
- 2) Use drought tolerant plants such as succulents because of their ability to quickly absorb and hold water.
- 3) Create additional open space amenity by considering views to and from the roof, incorporating seating and walkways and creating distinct spaces, such as focal points with water features or sculpture.
- 4) Include vegetated roof design on 50% of all commercial buildings.
- 5) Refer to:
 - See City Code Section 17.10.080 Stormwater Management Criteria.
 - Maryland Stormwater Design Manual, Chapter 5⁷
 - Maryland Stormwater Design

Details



Typical Extensive Green Roof Section

Permeable Paving

Permeable paving reduces impervious surface area, treats water at the site and promotes infiltration.



Photo credit:
Jim Urban



Back Creek Park, Annapolis

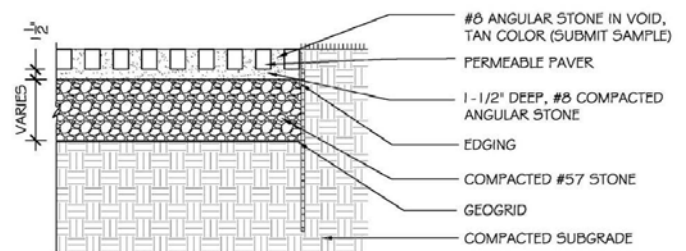
6) Refer to:

- Maryland Stormwater Design Manual, Chapter 5¹¹
- Maryland Stormwater Design Manual, Appendix B.4¹²
- Stormwater Manager's Resource Center website – Alternative Pavers¹³

Things to Consider

- 1) Combine with other methods to manage stormwater on site.
- 2) Design the system to infiltrate as much stormwater as possible in order to contribute to aquifer recharge.

Details



Typical Permeable Pavers for Vehicular Application

Requirements, as Applicable

- 1) All new paving shall incorporate permeable paving. All paving surfaces except vehicular travel lanes shall be pervious paving.
- 2) Begin site planning early. Grading, erosion control during construction and available space must be coordinated from the outset.
- 3) High traffic areas are unsuitable. Parking areas, patios/terraces and walkways provide appropriate opportunities.
- 4) Slopes shall be 5% or less.
- 5) Sweeping and vacuuming twice yearly and servicing cleanouts regularly is required maintenance and shall be included in the maintenance plan.

Vegetated Swales

Vegetated swales are valuable for providing stormwater conveyance, improving water quality and reducing runoff velocity and peak flow. Grass swales, bioswales, and wet swales vary in application and must follow Maryland stormwater management design requirements.



Requirements, as Applicable

- 1) Grass swales are commonly used for linear (roadway) applications. The maximum flow depth shall be 4 inches. Refer to Maryland Stormwater Design Manual, Chap 5¹⁴
- 2) Bio-swales shall have 2 to 4 feet of soil media designed for maximizing filtration to temporarily store a target minimum of 75% of runoff volume for the 24-hour 1-year event for the project area.
- 3) Wet swales are appropriate for areas with a high water table and shall be designed to temporarily store up to 75% of runoff volume for the 24-hour 1-year event for the project area.
- 4) Maintenance shall include keeping the centerline of the swale channel clear. Remove volunteer invasive woody plant material.
- 5) Refer to:
 - City Code Section 17.10 Stormwater Management
 - Maryland Stormwater Design Manual, Appendix A¹⁵
 - Maryland Stormwater Design

Manual, Appendix B.3¹⁶

Things to Consider

- 1) Treat, retain and/or store a quantity of runoff beyond that required by the State.
- 2) Create a native planting zone that favors wildlife in terms of providing cover and a food source; specify native plants.
- 3) Use plants that tolerate moisture fluctuations and take advantage of moist soil conditions.

Detention and Retention Ponds

Detention ponds and retention ponds are stormwater management facilities sized to accommodate specific size rain storms.



Requirements, as Applicable

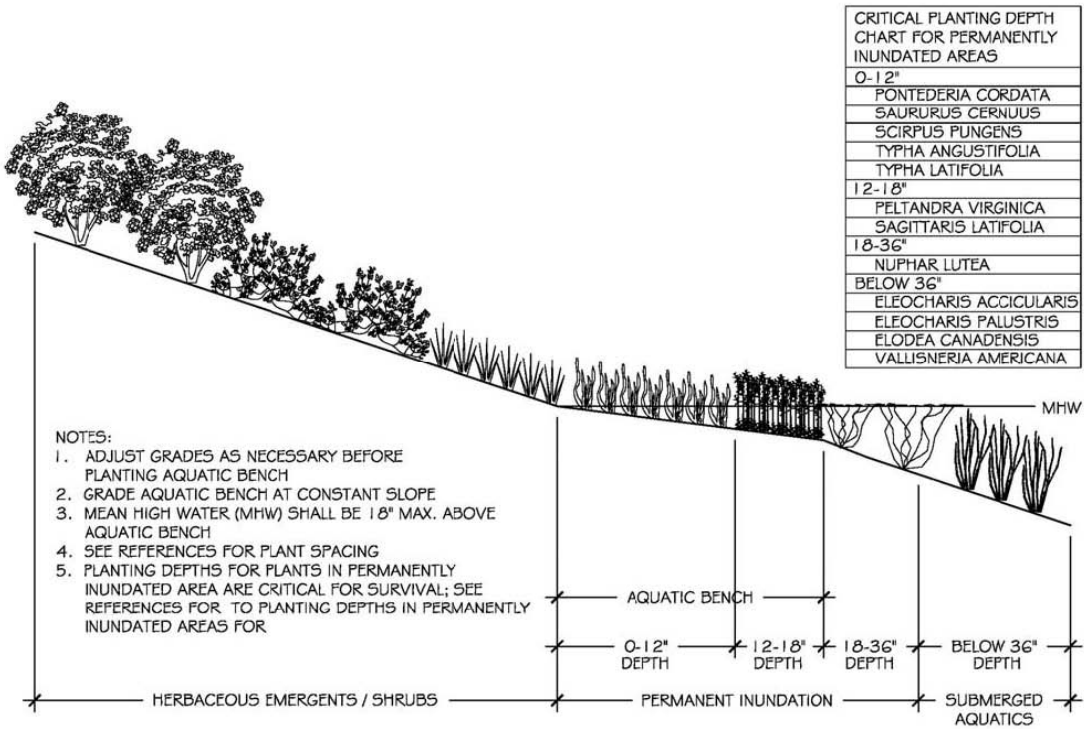
- 1) Professional design services are required. A grading plan prepared by a civil engineer and a planting plan prepared by a landscape architect are required. Refer to City Code Section 17.10 Stormwater Management, including 17.10.090 Specific Design Criteria and Analytical Methods.

- 2) Use detention and retention ponds only when regulations cannot be met with environmental site design (ESD) methods as listed in the Maryland Stormwater Design Manual, Chapter 5¹⁷
- 3) Consult Maryland design guidelines related to pond capacity, size and depth. See Appendix B.1 and Appendix B.1.1 of the Maryland Stormwater Design Manual¹⁸
- 4) Planting on slopes must be designed to stabilize the slope, prevent erosion and trap or filter potential nutrients (i.e. fertilizer) present in runoff from adjacent turf areas. Maryland Stormwater Design Manual, Appendix A¹⁹.
- 5) Near the normal water line the planting plan must show species and location of plants appropriate for the frequency of inundation, which is related to normal water level and expected rainfall. See detail below for grading and planting information related to normal water level and inundation frequency.
- 6) Select plants according to water level and soil moisture level. In general, the moisture level of the soil on a slope will decrease as the elevation above the water increases.
- 7) Plant native plants, grasses and wetland plants.
- 8) Stabilize remaining slopes with temporary or permanent seeding according to Section G -Vegetative Practices of the 1994 Maryland Specifications for Soil Erosion and Sediment Control²⁰.

Things to Consider

Use native plants to attract pollinators such as birds and butterflies.

Details



Typical Pond Planting

Grading and Erosion Control Measures

- **Technical and Aesthetic Grading**
- **Sediment and Erosion Control**
- **Steep Slope Stabilization**
- **Living Shorelines**
- **Soil Management**

The objectives of the section on grading and erosion control measures are protecting landforms, natural resources, shorelines, existing vegetation, soil resources and water quality, as well as enhancing aesthetics and minimizing construction costs by minimizing grading.

Guidance on permanent erosion control measures relates to all of the goals stated in the introductory chapter.

Principles

- 1) Careful grading design and implementation can protect existing resources such as trees, wetlands, and streams, and minimize disturbance to steep slopes, soil ecology, wildlife and habitat.
- 2) Minimize the extent and duration of the grading activities to help protect the natural features and resources on a site.
- 3) The character of the native landform should be considered prior to initiating a technical grading plan; aesthetics should always be considered.
- 4) Preventing water sedimentation, water pollution, shoreline erosion and soil degradation benefits humans, flora and fauna by preserving conditions conducive to

life, health, recreation and development.

- 5) Multiple design techniques may offer benefits not available from a single technique or approach.
- 6) A passive stabilization approach that utilizes natural methods, such as vegetative stabilization, landscaping, and non-synthetic matting, is preferred for its ability to minimize overall disturbance, when conditions warrant.
- 7) Using living shorelines provides an opportunity to create naturalistic shoreline protection that will resist further erosion.
- 8) Erosion prevention and remediation improves water quality.
- 9) Living shorelines help protect property.
- 10) Multiple techniques may offer benefits not available from a single technique.
- 11) Soil is the backbone of a successful landscape.
- 12) Physical, chemical and biological properties, along with drainage capacity, affect suitability of soil for planting. When soil is improved, less short term treatment and long term management is required. Additionally, soil improvement optimizes landscape function, aesthetics and return on investment.
- 13) Urban soils are often disturbed and differ from native soils in drainage and moisture retention capacity, fertility, texture and organic matter content.

Technical and Aesthetic Grading

Grading is the foundation of good design, both functionally and aesthetically. Technically correct

grading will work with the site's natural features to control water flow, minimize erosion, and avoid impacts to natural resources. Fit the development to the site rather than altering the site to fit the development. Grading can enhance the beauty of a site by artfully controlling the landform.

Requirements, as Applicable

- 1) A grading permit application must be submitted by an appropriate professional. Refer to City Code Section 17.08 Grading, Erosion and Sediment Control, specifically 17.08.160 Erosion and sediment control—General requirements.
- 2) Prioritize use of grading, non-structural stormwater solutions and water quality improvement measures. Use structural solutions only when other solutions are not feasible. Refer to Maryland Standards for Stormwater and Soil Erosion – Sections B, F, and G²¹
- 3) Design grading to minimize disturbance in the critical root zone (CRZ) and areas of good soil resources.
- 4) Balance cut and fill to avoid offsite disturbance.
- 5) Minimize cut and fill to avoid damage to soil, vegetation, habitat, and natural resources.
- 6) In areas to be graded topsoil shall be stockpiled, tested and amended according to results from the soil testing laboratory. Re-use soil on site where feasible.
- 7) Grading plans shall include 2' contour intervals for slopes over 3:1; 1' contour intervals for slopes under 3:1; and ¼' contour intervals for grades of 5% and less.

- 8) Design grades of paving such that the maximum amount of water flows through bioretention areas and rain gardens before leaving the site.
- 9) Ensure positive drainage away from all structures and follow engineering standards for minimum gradients on paving and for vegetated areas. See City Code Section 17.08.210 Drainage.
- 10) Design grades to slow the flow of water on and away from the site. This will encourage infiltration and increase potential for treatment.
- 11) Appropriate erosion and sediment control measures shall be implemented during construction.
- 12) Design grades to provide aesthetically pleasing results in addition to functional results.
- 13) Incorporate phased grading plans to minimize the amount of disturbance happening at one time.
- 14) Protect and avoid natural resources such as steep slopes, highly erodible soils, streams, and wetlands when developing the site plan.

Sediment and Erosion Control

Sediment and erosion control refers to preventing stormwater from causing erosion on sites that would lead to a loss of soils, and to preventing sediment from washing off the site during construction that would pollute our waterways.

Requirements, as Applicable

- 1) Determine the requirements according to the Annapolis Department of Neighborhood and Environmental Program's (DNEP) Stormwater Management and Erosion and Sediment Control

webpage²² for forms and related information.

- 2) Wooden-stake silt fence may not be used in the City. The minimum type of silt fence acceptable for use is a reinforced silt fence that has a welded-wire backing with metal stakes.
- 3) Before construction goes vertical, the entire site must be temporarily stabilized. After this point, the site stabilization must be maintained on a daily basis.
- 4) All sediment and erosion controls must comply with the Maryland Department of the Environment (MDE) Standards and Specifications.
- 5) Submit a Standard Erosion and Sediment Control Plan for all permits that include ground disturbance but do not need a grading permit²³
- 6) A grading permit is required if:
 - More than five thousand square feet of ground shall be disturbed; more than two thousand square feet for waterfront lots.
 - Cuts and fills exceed ten feet in depth or height and exceed one hundred cubic yards in volume.
 - Slopes with a grade of fifteen percent or greater are disturbed and slopes steeper than 3:1 are created.
 - Highly erodible soils are disturbed.
 - Earth disturbance is being proposed within the following areas, with the exception of shoreline stabilization projects and retaining wall replacements in kind:
 - The limits of the one hundred-year floodplain of any stream;
 - One hundred feet of any

perennial stream or water body;

- One hundred feet landward of the mean high water line of any water body affected by tidal action (subject to variance procedures in Title 21 of the City Code);
 - One hundred feet from any tidal wetland or bog; or
 - Twenty-five feet of any non-tidal wetland except for an approved buffer management plan approved by the City for clearing less than five thousand square feet of vegetation.
- The proposed construction is a single family dwelling or an addition or modification that is classified as a substantial improvement to an existing single family dwelling as determined in accordance with City of Annapolis Code.



- Any proposed grading will impair existing surface drainage, constitute a potential erosion hazard or act as a source of sedimentation to adjacent land or water resource or impact an erosion and sediment control plan previously approved by the Anne

Arundel Soil Conservation District or the City of Annapolis.

- Projects over 1 acre need to get an NPDES permit from MDE

The goal of the City of Annapolis is to reduce impervious surfaces (asphalt, concrete, home footprints, etc) by 50%. If this cannot be done, WQv must be treated at a rate of 50% of the total WQv calculated (per MDE design manual and City Code).

WQv and Rev may be treated per the design manual methods. All treatment must be quantified. Treatment examples include:

- Rooftop and non-rooftop disconnect credits
- Greenroofs
- Raingardens
- Infiltration trenches

Please note tree plantings do not count for WQv treatment per the design manual.

Any Stormwater Management (SWM) facility must have a signed SWM maintenance agreement, ensuring it is properly inspected and maintained on a regular basis. Maintenance logs should be kept for each separate facility and shall be made available upon the City's request. If you need help setting up a maintenance log, please contact the Department of Neighborhood and Environmental Programs at 410-263-7946.

If your project has a SWM facility, you will be required to sign the SWM maintenance agreement before the grading permit will be issued.

Information on obtaining the SWM maintenance agreement will be given upon initial review of the grading permit application.

CPv, Qp and Qf are required on a case-by-case basis. Please have your engineer verify if the site conditions require these additional controls.

Steep Slope Stabilization

Steep slope stabilization and living walls are designed to prevent soil erosion through establishing vegetation on steep to near-vertical slopes. Many geo-textile products are available that are designed to promote vegetative growth on slopes. The vegetation increases cover, which reduces the impact of rain, and the roots hold the soil together on the slope, minimizing the potential for sediment transport by runoff. Besides the erosion prevention, this type of stabilization also buffers the damage caused by wave action.

Requirements, as Applicable

- 1) Use living walls and geotextiles to stabilize steep slopes wherever feasible.
- 2) Stabilize slopes steeper than 3:1 after careful assessment of conditions and products to determine which type of natural or geo-textile product is best.
- 3) Use geo-textile products for applications with slopes between 3:1 and 2:1. Apply the geo-textile to the face of the slope.
- 4) Plant the face of the living wall with native plant material.
- 5) Refer to City Code Section 21.54 Critical Area Overlay and COMAR Title 27 - Critical Area Commission

for the Chesapeake and Atlantic Coastal Bays²⁴

- 6) Incorporate a vegetated buffer at the top of the slope to act as protection against erosive stormwater runoff.

Things to Consider

- 1) Where living walls are chosen as the approach use these recommendations. For slopes that are steeper than 2:1 construct a living wall, a system of stabilizing the slope by stacking rolls of soil mix, one on top of the next, against the face of a slope. A lightweight composted soil mix is pumped into filter fabric tubes that are stacked against the slope. The process creates minimal disturbance to the slope. (This type of wall eliminates hydrostatic pressure and filters the water that passes through the soil contained in the stacked tubes.)
- 2) Select plants to increase wildlife habitat.

Living Shorelines

Living shorelines serve to prevent erosion and remediate for prior erosion within tidal waters. The components include marsh creation near the low and high water lines and stabilized sills to support additional native riparian planting.

Requirements, as Applicable

- 1) Employ living shorelines at all sites where conditions are suitable.
- 2) Refer to City Code Section 15.16

Details

Port Wardens, 15.20 Permits, 17.11 Floodplain Management and 21.54 Critical Area Overlay.

- 3) See also COMAR 26.23 Nontidal Wetlands and 26.24 Tidal Wetlands.
- 4) Additionally, check Maryland Department of Natural Resources – Shore Erosion Control website²⁵ and Maryland Department of the Environment – Shore Erosion Control Guidelines²⁶

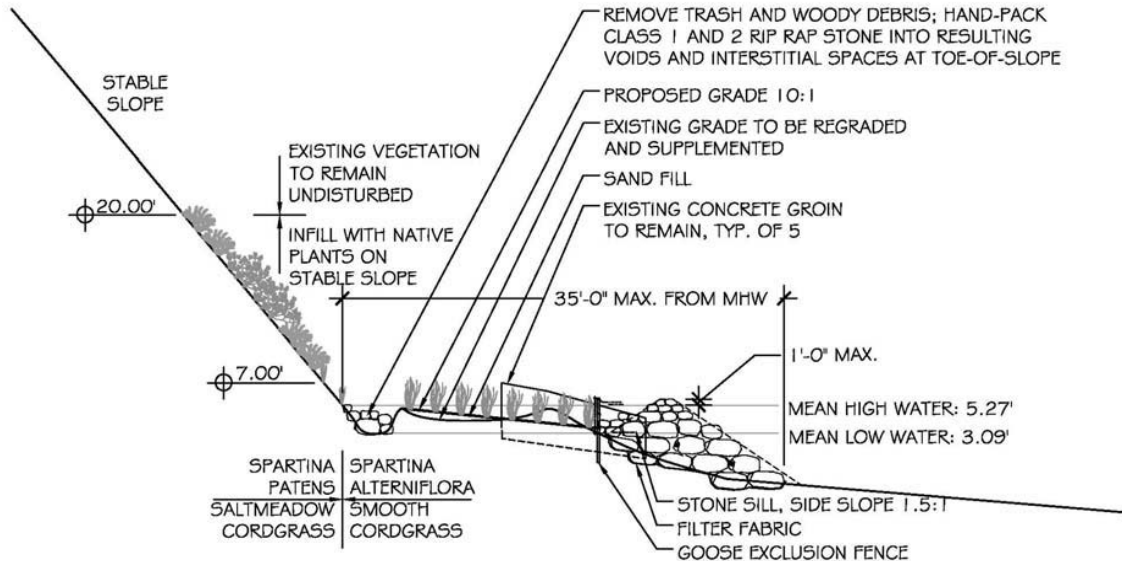
Things to Consider

- 1) Use living shorelines to increase vegetative and wildlife habitat for native species.
- 2) Create environmental education and demonstration opportunities associated with the living shoreline.
- 3) Properly evaluate shorelines to ensure that they are not being over-protected with an overabundance of stone. Stone should be minimized where possible to create conditions friendlier to wildlife. Many shorelines do not have high wave action and do not need much stone.



NOTES:

1. REGRADE PROPOSED MARSH AREA (EXISTING GRADE AND SAND FILL) TO 1:10 SLOPE
2. LOCATE LANDWARD EDGE OF SILL JUST BELOW MEAN LOW WATER; ARRANGE STONE AROUND EXISTING GROINS
3. WRAP FILTER FABRIC UP AROUND LANDWARD SIDE OF SILL TO ABOVE MEAN LOW WATER LEVEL
4. VERIFY MEAN HIGH WATER LEVEL AND MEAN LOW WATER LEVEL IN THE FIELD AND LOCATE ELEMENTS AND PLANTINGS ACCORDINGLY
5. PLANT BETWEEN EXISTING GROINS



Living Shoreline – Marsh Creation with Sill

Soil Management

The objectives of the section on soil management are multiple, including ensuring that proper soil resources are available for plants, both existing and proposed; protecting existing trees and root zones by minimizing disturbance (e.g., minimize grading); physically, chemically and biologically balanced soil maintains hydrologic patterns such as surface and subsurface drainage, therefore, restoring balance to soil assists in restoring hydrologic patterns; protecting existing landscape features from erosion and waterways from sedimentation; and healthy soil is more resilient and less susceptible to minor disturbance.

Soil management guidance relates primarily to the goals of sustainability, water conservation and cost-effectiveness.

Soil management provides an opportunity to significantly affect plant establishment, development and long term survival.

Requirements, as Applicable

- 1) Perform analysis of each soil type for physical/structural and chemical properties as well as organic matter.
- 2) Create an existing soil analysis diagram indicating the following types of soils and soil conditions.
 - Type 1: undisturbed - original soil

- horizons intact
 - Type 2: disturbed – suitable for supporting plants
 - Type 3: disturbed – with amendment and compaction remediation, could support plants
 - Type 4: disturbed – not suitable for plants due to contamination, high pH, heavy subsoils or anaerobic conditions.
- 3) Create a proposed soil preservation and improvement plan indicating the following areas:
- Areas to remain undisturbed with preservation and protection methods
 - Grading plan
 - Areas where topsoil will be removed and locations for stockpiling topsoil
 - Limits of different soil treatments
 - Detailed sections of soil improvements
- 4) Provide suitable growing conditions for all plant types shown on the planting plan. The minimum requirement for all lawn and planting beds shall be one of the following options.
- Option 1: Preserve undisturbed native soils protected during construction from compaction and contamination.
 - Option 2: Remove and stockpile O and A horizons of the existing native soils. Fracture or rip the top 10-12" of the rough-graded subsoil to loosen and create drainage. Apply 8" of stockpiled native topsoil over fractured subsoil. Till sufficient compost into the soil such that the soil contains between 4-5% organic matter dry weight.
 - Option 3: Fracture or rip the top 10-12" of the rough graded subsoil to loosen and create drainage. Apply 8" of imported loam topsoil soil over fractured subsoil. Till sufficient compost into the soil such that the soil contains between 4-5% organic matter dry weight.
 - Option 4: In areas where existing site soil, at the end of the construction period, has a combined silt/clay content of between 20 and 55%, improve the soil and drainage by fracturing or ripping the soil to a depth of 18", and add 6" of compost to the fractured soil tilled into the top 6" of the soil profile.
- 5) On options 2-4 if subsoil below 18" contains a hard pan or is compacted such that the soil's drainage rate is less than 0.5" per hour, develop adequate surface drainage by increasing slopes on the planting beds or adding subsurface drain lines.
- 6) Topsoil as used here is defined as a naturally occurring soil from the O and A horizons of the soil profile with between 20 and 55% combined silt/clay, naturally occurring soil organic matter of between 3 and 6% and pH of between 5.5 and 7.3. Topsoil shall not contain chemical components at levels harmful to plants. Topsoil shall not be sand/topsoil/compost mixes.
- 7) For large canopy trees in beds smaller than 200 square feet, develop plans to provide a minimum of 450 cubic feet of soil adequate to support tree growth. Improved soil within the planting bed to depths of

up to 42" is assumed to be included in the volume of usable soil. Street trees and trees in parking lots must include soil under paving if required to meet the calculation. Systems such as Silva Cells, CU Structural Soil, or equal may be used to provide planting soil under pavement. When calculating soil volumes the volume of the structure shall not be counted. The Silva Cell system is assumed to contain 7% structure. The CU Structural Soil is assumed to contain 80% structure.

- 8) Planting soils in vegetative storm water management areas and rain gardens shall be planting soil mixes with a drainage rate of at least 5" per hour with the soils settled but not compacted to root limiting, assumed to be 80% of maximum dry density proctor. Sand/topsoil/compost mixes with a minimum depth of 24" meeting these requirements are acceptable. If the subsoil below the planting soil drains at less than 1 inch per hour, subsurface drain lines shall be installed.
- 9) Protect existing soil resources by fencing (similar to tree protection) before and during construction activity to avoid traffic, compaction and inadvertent pollution.

Things to Consider

Use compost tea, organic fertilizers and compost amendments to maintain soil and plants.

Pedestrian and Vehicular Circulation

- **Parking and Loading**
- **Parking Lot Green Space**
- **Bicycle Parking**
- **Sidewalks**
- **Trails – Hiker/Biker and Equestrian**
- **Crosswalks**
- **Traffic Calming**
- **Sight Visibility Triangles**

The objectives of the section on pedestrian and vehicular circulation include enhancing mobility and accessibility (see the Annapolis Comprehensive Plan), providing safe transportation facilities and ensuring convenience.

Benefits include providing transportation options, reducing traffic congestion and confusion, improving air quality, promoting healthy lifestyles, encouraging public interaction and creating a connected network of alternative transportation within the City of Annapolis.

Pedestrian and vehicular circulation guidance relates primarily to the goals of sustainability, context, livability and safety.

Principles

- 1) Parking is space-intensive. Underground and multi-story facilities (with vegetated roofs) minimize the land used per vehicle.
- 2) Landscape aesthetics are influenced by placement of vehicles on the site, landscape design and maintenance.

- 3) In order to ameliorate environmental impacts, planting areas need to be within or near the boundaries of the parking lot.
- 4) Planting associated with parking areas reduces urban heat island effect by shading impervious surfaces.
- 5) Planting associated with parking areas increases comfort of drivers, passengers and pedestrians by shading vehicles during hot summer months. If deciduous trees are planted, winter sun will still penetrate car windows.
- 6) Bicycling infrastructure encourages bicycling and supports alternative transportation, reducing traffic congestion and air pollution.
- 7) Secure bicycle parking encourages would-be riders to participate
- 8) Trails provide opportunities for social interaction, exercise and outdoor experiences.
- 9) Where alternative transportation infrastructure is available people may opt not to drive, which improves air and water quality.
- 10) Trail networks enhance the community's connection to the environment and our cultural heritage.
- 11) Shared use trails require consideration of the needs and characteristics of the users (horse and rider, bicyclists and/or pedestrians).
- 12) Promoting motorist awareness of pedestrians and bicyclists and their routes enhances public safety.
- 13) Studies of residential real estate sales have shown that proximity to a trail is a preference for home buyers.
- 14) Perceived safety or danger will affect use and effectiveness, especially in

an urban setting.

- 15) Highlighting crosswalks with appropriate lighting and signage will reinforce pedestrian safety.
- 16) Narrow streets and short visibility distances slow down motorists.
- 17) Traffic calming can be used to create safer streets. Safer streets encourage pedestrian activity and lively communities.
- 18) Raised crosswalks achieve dual purposes of slowing motorists and providing for pedestrian safety.

Parking and Loading

Parking and loading provide access and add value for businesses and housing. They are also infrastructure with high space requirements and no inherent ecological benefit. Typical parking treatments increase impervious surface area and contribute to urban heat island effect; concentrate pollution; and increase potential water pollution.

Requirements, as Applicable

- 1) Provide parking and loading according to Code including number of spaces and location. Refer to City Code Chapter 21.66 Parking and Loading Regulations, including Section 21.66.010 Parking and Loading Facilities Required, Section 21.66.030 Number of Required Parking Spaces, Section 21.66.050 Location of Parking Spaces, Section 21.66.080 Loading Facilities, Where Required, Section 21.66.090 Number of Required Loading Spaces, Section 21.66.100 Location of Loading Facilities, and Section 21.66.130 Table of Off-Street Parking Requirements.
- 2) Ninety degree parking space size

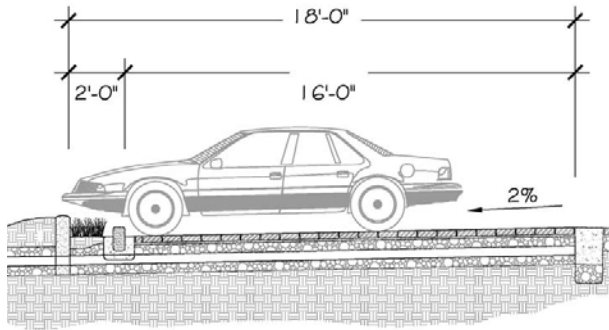
shall be a minimum of 8'-0" x 16'-6". (plus overhang). Exceptions to this will be based on promotion of public safety and demonstration of environmental benefit. See City Code Section 21.62.120 Parking and Loading for Configuration Options and Dimensions.

- 3) Parallel parking space size shall be 8'-0" x 20'-0" for standard cars.
- 4) Provide an overhang: reduce the length of parking spaces to 16'-6" so that cars hang over the curb 1'-6". Plant the overhang zone according to **Parking Lot Green Space**. Install wheel stops such that they are stable and appropriate to traffic.
- 5) Use permeable paving according to the **Permeable Paving** section.
- 6) Incorporate stormwater management into parking configuration; use permeable paving and/or bioretention areas within the parking lot.
- 7) Collect and treat runoff on site in small dispersed treatment areas.
- 8) Refer to City Code Section 21.64 Standards for Uses Subject to Standards for zoning-specific guidelines.

Things to Consider

- 1) Arrange for shared parking with an adjacent property owner.
- 2) Provide preferred spaces for hybrid vehicles, electric vehicles, and compact cars to encourage fuel efficiency and alternative transportation.
- 3) In order to reduce heat island effect use light colored materials or shade parking spaces.

Details



Parking Space with Planted Overhang

Parking Lot Green Space

Parking lot green space serves to counter negative impacts of parking by improving the aesthetic and diversity of the landscape, treating stormwater, improving air quality, minimizing urban heat island effect and increasing comfort and safety for users. Additionally, Annapolis established a citywide goal in 2008 to increase tree canopy coverage to 50% by 2030.

Requirements, as Applicable

- 1) Interior green space is required to equal a minimum of 15% of the total parking lot area. See diagram below.
- 2) One shade tree is required per seven parking spaces.
- 3) Trees must be planted within allotted interior green space. See diagram below for interior green space.
- 4) Planting islands must be 10'-0" wide and the length of a parking space.
- 5) Even distribution of trees and green space within the parking area is recommended, but parking island configuration is not predetermined.
- 6) Plant materials shall be drawn from approved lists or subject to approval by the City. Trees shall be 3" caliper

or a minimum of 12' in height, whichever is greater.

- 7) Provide an overhang and plant the overhang zone with groundcover, low perennials, gravel or mulch. Install wheel stops such that they are stable and appropriate to traffic.
- 8) Refer also to City Code Section 12.28 Parking Places and Parking Lots and 21.62 Site Design Standards.

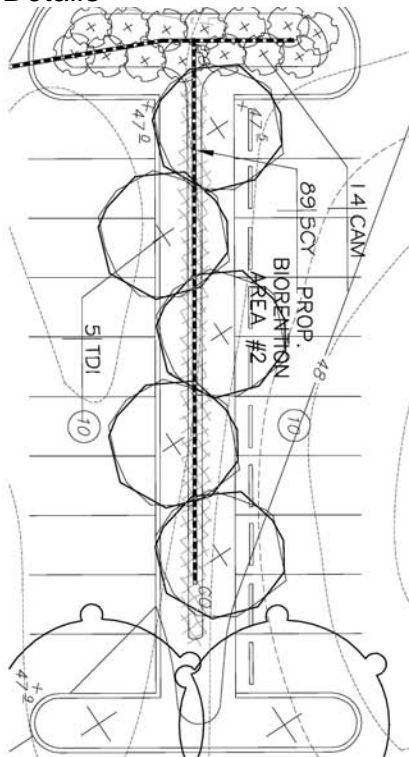


Things to Consider

- 1) Incorporate stormwater management into parking configuration; use permeable paving in conjunction with bioretention areas within the parking lot to create multi-purpose infrastructure.

- 2) Refer also to Center for Watershed Protection – Better Site Design: A Handbook for Changing Development Rules in Your Community, Chapter 4 – Technical Support for the Model Development Principles²⁷ and LEED 2009 for New Construction and Major Renovations – Sustainable Sites²⁸

Details



Parking with islands and bioretention

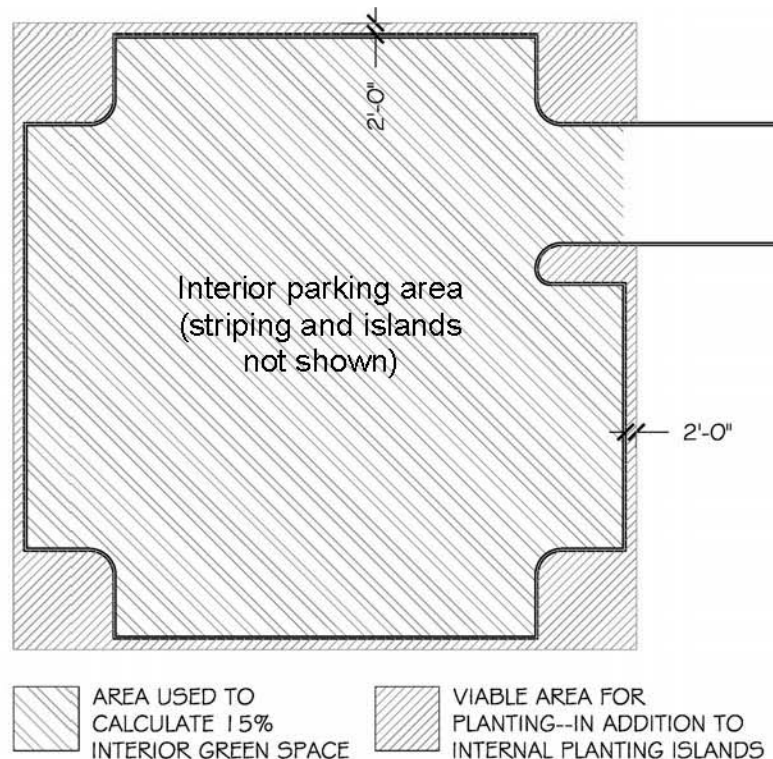


Diagram for parking lot area calculation and parking lot planting requirements calculation

Bicycle Parking

Bicycling, a “green” and efficient means of transportation, gains value in cities with narrow streets and traffic congestion. Supplying bike parking supports alternative, clean transportation.

Requirements, as Applicable

- 1) Provide bike parking for 5% of building users or according to City Code Section 21.66.030 Number of Required Parking Spaces.
- 2) Locate bike parking near the building entrance (within a 30 second walk). Refer to Association of Bicycle and Pedestrian Professionals website – Bicycle Parking Guidelines²⁹.
- 3) Provide easy access from the street and protection from motor vehicles according to City Code Section 21.62.130 Pedestrian and Bicycle Circulation.
- 4) Ensure that parking is visible to patrons and passersby to promote usage and enhance security.
- 5) Do not impede or interfere with pedestrian traffic flow.
- 6) Bike racks shall support the bike in two places in an upright position.
- 7) Bike racks shall accommodate bikes with various frame types.
- 8) Bike parking shall not damage bicycles and shall prevent bike wheels from tipping over.
- 9) Bike parking shall accommodate high security U-shaped bike locks.
- 10) Bike parking shall accommodate locks securing the frame and both

wheels (preferably without removing the front wheel from the bicycle).

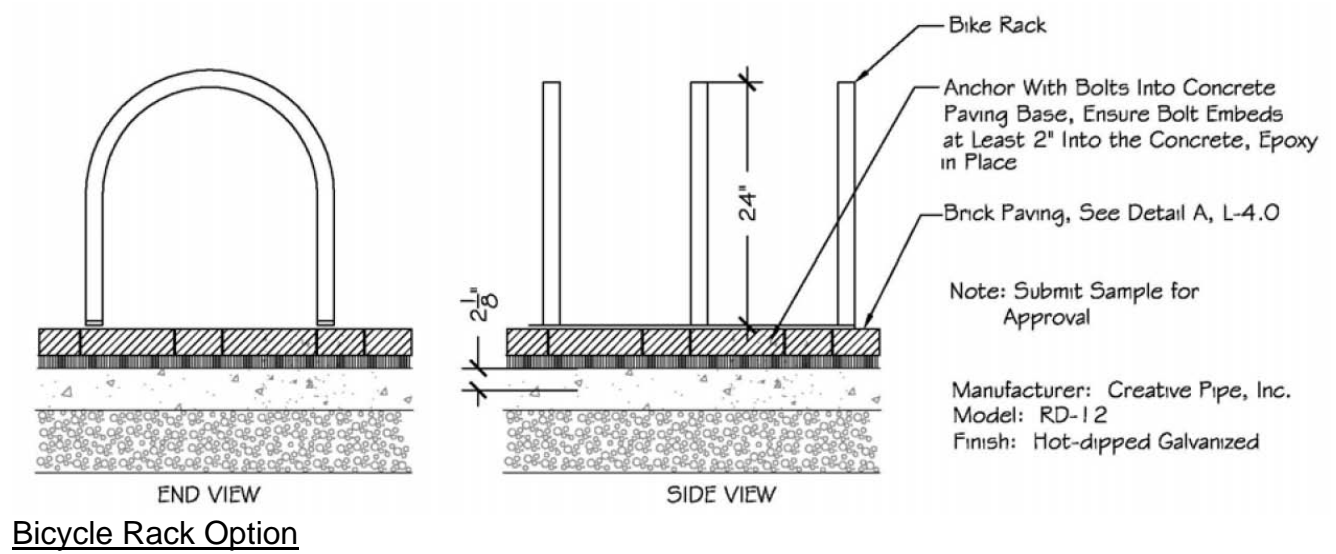
- 11) Bike racks shall have no moving parts.
- 12) Vertical elements (such as inverted U racks) shall be min. 30” on center.
- 13) Allow 72” depth for bicycles, 48” for an aisle between the rows of bicycles and a min. 24” radius between the rack elements and any structure.
- 14) Refer also to AASHTO’s 1999 Guide for Development of Bicycle Facilities³⁰.



Things to Consider

Cover parking where possible, especially where users will leave their bikes for long periods of time.

Details



Sidewalks

Sidewalks provide pedestrian infrastructure, encourage exercise and socializing, complement the character of a neighborhood, and contribute to pedestrian-friendly walkable cities.

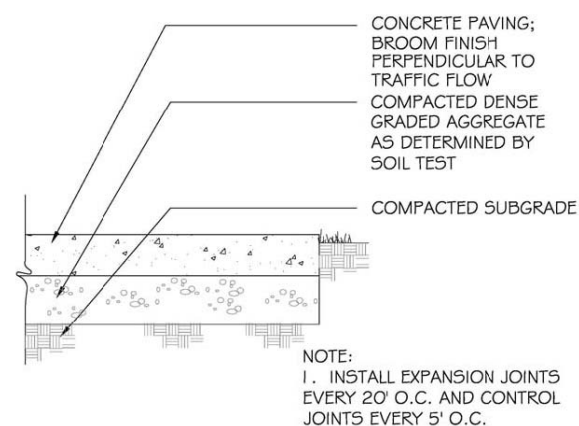
Requirements, as Applicable

- 1) In high density urban areas and areas with buildings near the street, a minimum four foot wide sidewalk is required between building and curb. See City Code Section 14.04 Sidewalks.
- 2) For all new construction provide a minimum four foot wide accessible sidewalk free of obstructions.
- 3) Sidewalk edges should be stable. In the case of pavers or brick sidewalks that are not bounded by buildings or curbs, use fixed and stable edging to contain unit pavers
- 4) For materials and patterns refer to Paving Materials and Patterns section.
- 5) Refer to Building in the Fourth Century: Annapolis Historic District Design Manual, 2007, Chapter 4, Design Guidelines for material and paving pattern selection in the Historic District.
- 6) Detectable warning pavers shall comply with ADA regulations (raised truncated domes: diameter of nominal 0.9 in., height of nominal 0.2 in., center to center spacing of nominal 2.35 in. Only paver systems shall be used; no surface mounted systems shall be used. Detectable warning pavers' color shall contrast with the color of surrounding paving.
- 7) Refer to City Code Section 20.24.080 Sidewalks when addressing subdivision requirements.

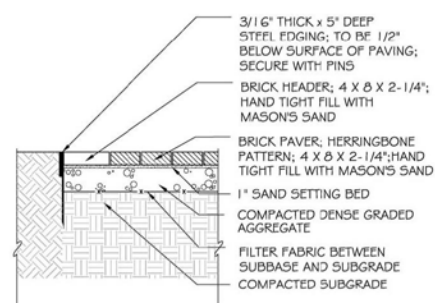
Things to Consider

- 1) Use recycled or salvaged materials where feasible.
- 2) Slope sidewalks toward planting or turf areas instead of toward a gutter to reduce runoff and to efficiently and naturally store water within the soil.
- 3) Include permeable pavers wherever feasible, particularly where the sub-grade drains well.

Details



Concrete Sidewalk Paving



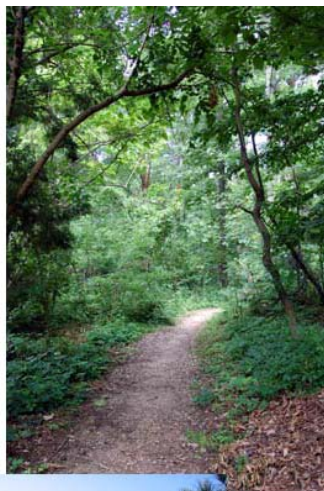
Brick Sidewalk Paving

Trails – Hiker/Biker and Equestrian

Trails provide recreational opportunities and connect people and places, linking residential areas to commercial zones, recreational open space and parks.

Infrastructure may include designated travel lanes/trails/paths, trailside resting spots, related signage and lighting.

Land availability, acquisition and retention, trail access, shared use trails, erosion and water quality issues all affect trails and conditions for users. In addition to trail planning and alignment, site-specific design is critical to the success of trail effectiveness and function.



Requirements, as Applicable

- 1) Include trails wherever indicated in the Annapolis Comprehensive Plan. Refer to City Code Section 21.62.130 Pedestrian and Bicycle Circulation.
- 2) For trail alignment respect land forms, geology, hydrology, wildlife, views, historic attractions and points of interest. Minimize negative environmental impact from the planning stage.
- 3) If an existing trail (or bike lane) abuts the property it shall be extended if a future/potential trail is indicated on the bike plan. If the trail does not exist but is indicated on the bike plan, the design must accommodate the trail and any corresponding easements as needed for future trails.
- 4) After using maps to establish the initial alignment, walk proposed trails to confirm or adjust alignment based on field conditions, considering soil moisture, specimen plants, geologic features and potential trail connections, for example.
- 5) Link into existing trails to lengthen and enhance trail systems.
- 6) Provide five to thirty miles of connected trails where possible. Horses can cover thirty miles in a day (equestrian).
- 7) Design paths with a width of ten feet for two-way shared use paths (hiker/biker).
- 8) Plan for five feet for bike lanes on roadways, excluding the street gutter.
- 9) Width of tread shall be 4' for one-way paths and 6' for two-way paths (equestrian).
- 10) Width of cleared space shall be 8' for one-way paths and 12' for two-way paths (equestrian).
- 11) Cleared height shall be 10' minimum (equestrian).
- 12) Combined use trails shall have a sight distance minimum of 100 feet.
- 13) Designated lanes or trails adjacent to motor vehicle travel shall be distinctly marked.
- 14) Use contrasting materials, paving or paint patterns to distinguish lanes or

trails where they run parallel or cross each other.

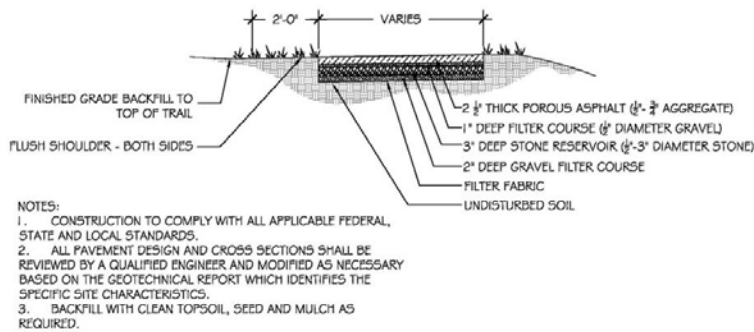
- 15) Provide sufficient room for trail users and minimize obstacles and hazards in the trail, such as storm drains and utility access points (all). Avoid obstacles in the path that would require a rider to dismount or alarm horses (equestrian).
- 16) Avoid grates with openings greater than 3/8 inch and elements that protrude above grade in the travel lane.
- 17) Use natural (relatively loose) well drained materials such as natural soil, crushed gravel or wood chips for trail surfaces. See Iowa Department of Transportation – Iowa Trails 2000, Chapter 4, Design Guidelines: Use Modes³¹
- 18) Provide stream crossings -- culverts are preferable to bridges (esp. equestrian).
- 19) Design for safety by assessing adjacent objects and building massing, lighting, proximity to populated areas and plant sizes and densities.
- 20) Use signage to indicate location of trail, mileage, direction, destination and points of interest.
- 21) Comply with ADA regulations and other universal access standards and recommendations. Refer to Federal Highway Administration website – Designing Sidewalks and Trails for Access, Part II of II: Best Practices Design Guide, Chapter 12, Trail Planning³²
- 22) Refer to Federal Highway Administration website, The Bicycle Compatibility Index: A Level of Service Concept, Implementation Guide³³
- 23) Refer to Federal Highway

Administration website, Equestrian Design Guidelines for Trails, Trailheads and Campgrounds³⁴

Things to Consider

- 1) Promote trails community-wide in order to reduce air pollution, promote individual health and encourage social interaction.
- 2) Use recycled, salvaged (re-used) or otherwise sustainable path materials.
- 3) Use sustainable materials to distinguish trails and crossing from motorists' travel lanes.
- 4) Educate through interpretive features that highlight site-specific environmental issues.

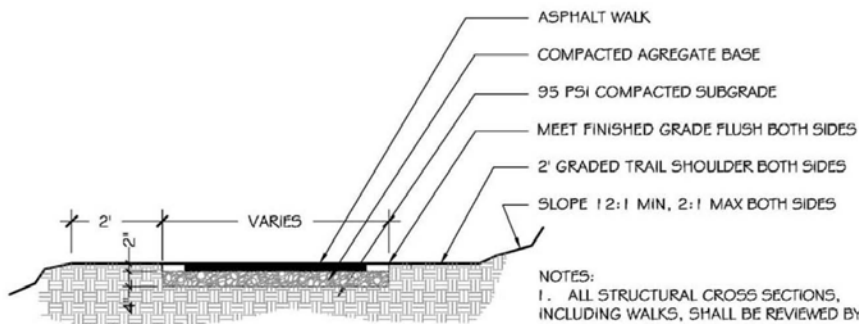
Details



1 POROUS ASPHALT TRAIL

1/2" = 1'-0"

DETAIL-FILE



NOTES:
1. ALL STRUCTURAL CROSS SECTIONS, INCLUDING WALKS, SHALL BE REVIEWED BY A QUALIFIED ENGINEER AND MODIFIED AS NECESSARY BASED ON THE SITE SPECIFIC GEOTECHNICAL REPORT.
2. WHERE DRAINAGE IS REQUIRED BELOW TRAIL PROVIDE 4" DIA. PVC PIPE AND GRAVEL SWALE.

ASPHALT TRAIL

3" = 1'-0"

DETAIL-FILE

Crosswalks

Crosswalks serve to guide the interactions of vehicles and pedestrians, thereby improving public safety in the urban environment. Additionally they may slow traffic through geometric layout or tie a neighborhood together aesthetically through consistency in design and material.



2006 edition including revision 1, July 2009 -Section 3B.26 Speed Hump Markings³⁶

4) Refer to:

- Manual on Uniform Traffic Control Devices -Chapter 2.B Regulatory Signs³⁷
- Federal Highway Administration website – Designing Sidewalks and Trails for Access, Part II of II: Best Practices Design Guide, Chapter 8 Pedestrian Crossings³⁸

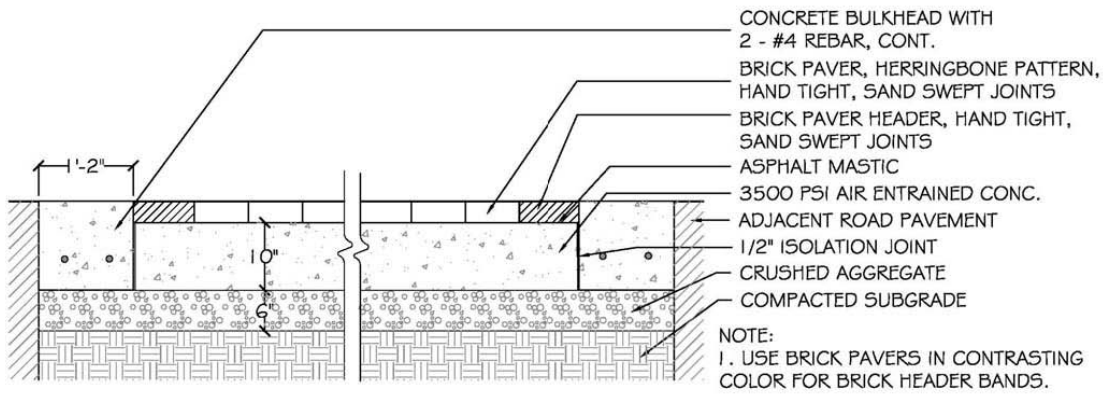
Things to Consider

Use environmentally-friendly materials such as recycled, salvaged or permeable paving where appropriate.

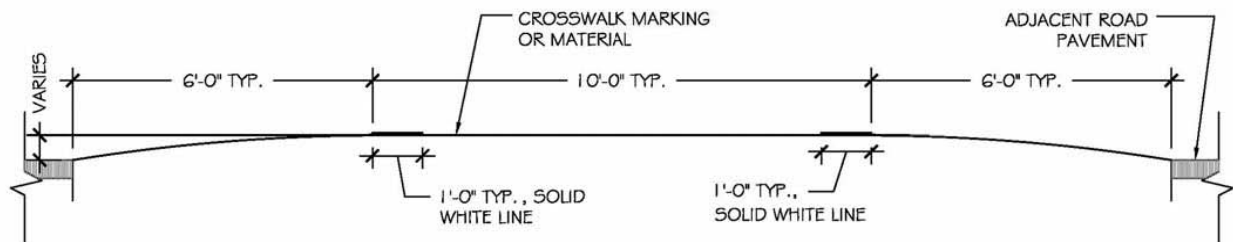
Requirements, as Applicable

- 1) Employ standard painted crosswalks where public safety is the primary concern. Refer to Maryland Manual on Uniform Traffic Control Devices for Streets and Highways, 2006 edition including revision 1, July 2009 Section 3B.17 Crosswalk Markings³⁵
- 2) Use alternative materials such as pavers or granite where they fit the contextual patterns of the surrounding neighborhood.
- 3) If mid-block crosswalks are required by the design, use raised crosswalks (speed humps) to calm traffic and post signs near pedestrian crossings. Refer to Maryland Manual on Uniform Traffic Control Devices for Streets and Highways,

Details



Typical Brick Crosswalk Section



Raised Crosswalk Section

Traffic Calming

Traffic calming measures are used to increase safety for all users of the road. The measures aim to slow traffic, reduce reckless driving and increase driver and pedestrian awareness by modifying the streetscape. Approaches to traffic calming may range from control officers managing traffic on site to fixed-in-place elements such as signs, striping, ground plane variations and narrowing of the roadway.

Requirements, as Applicable

- 1) Install vertical deflection measures such as speed humps, speed tables, raised crosswalks, raised intersections and textured pavements. Refer to Maryland Manual on Uniform Traffic Control Devices for Streets and Highways, 2006 edition including revision 1, July 2009, Section 3B.26 Speed Hump Markings³⁹.
- 2) Where speed humps and speed tables are used, do not impede stormwater flow at the gutter and provide space for bicyclists to pass between the curb and the traffic control structure.
- 3) Traffic calming can be achieved by reducing crossing distance at intersections, which benefits pedestrians.
- 4) Avoid creating a cluttered landscape when implementing traffic calming.
- 5) Striping or other variation in roadway surface material cues the driver to slow down at intersections.
- 6) For design related to universal access refer to Federal Highway Administration – Designing Sidewalks and Trails for Access, Part II of II: Best Practices Design Guide, Chapter 9 Traffic Calming⁴⁰



Things to Consider

- 1) Create communities that promote walkable streets and discourage reliance on the automobile.
- 2) Narrow streets where possible.
- 3) Improve drainage or permeability through traffic calming. Options include guiding stormwater to planted areas in bulb outs, chokers and chicanes.
- 4) Reducing impermeable surface benefits the environment; narrowing roadways reduces impermeable surface and positively impacts the environment.
- 5) Use recycled materials in traffic calming features.

Sight Visibility Triangles

Sight visibility at corners and along streets must be maintained clear and unobstructed. A sight visibility triangle is a triangular zone provided across corners to allow for unobstructed

visibility. This open space is required at the intersection of two streets and at the intersection of a driveway and a street. Sight visibility triangles ensure good visibility at intersections and driveways and, thereby, promote safety on the road.

Principles

Although there are no restrictions on plantings outside of the sight visibility triangle and the required clear space must be maintained, species selection adjacent to a sight visibility triangle is also important to minimize required pruning over time.

Requirements, as Applicable

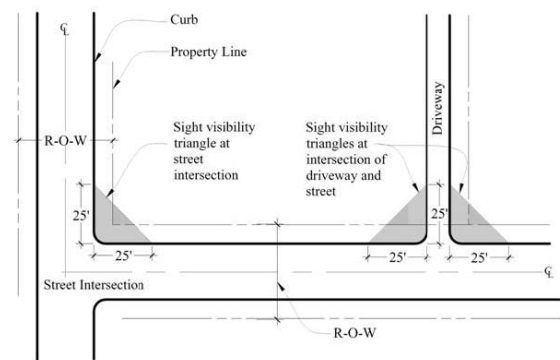
- 1) The sight visibility triangle is determined by drawing a diagonal line across the corner of a lot measured from two points drawn twenty-five feet back from the street or driveway intersections with a street according to City Code Section 21.62.050 Street Trees, 21.72.010 Terms.
- 2) Trees may not be planted within 30' of a street intersection or within 15' of a driveway or within 10' of a fire hydrant or utility pole according to City Code Section 14.12.140 Location.
- 3) Street trees may not be planted within 25' of a street intersection or within 15' of a driveway or a fire hydrant according to City Code Section 21.62.050 Street Trees.
- 4) Trees and shrubs shall be maintained so that they do not encroach on the vertical clear space required within the sight visibility triangles, between 2 ½' and 12' height above the street (10' height about a sidewalk) according to City

Code Section 14.12.150 Pruning and Removal of Trees and 21.70.050 Standards Applicable to All Signs.

- 5) Tree and shrub species shall be selected and planted that will not be deformed by pruning to maintain year round clear visibility.

Things to Consider

- 1) Where pedestrian paths will not be disturbed, use sight visibility triangles to maximize pervious surface and manage stormwater (with low plantings).
- 2) Use salt tolerant plants within sight visibility triangles.



Bufferyards and Screening

- **Property Line Buffers**
- **Right-of-Way Buffers**
- **Transitional Yards**
- **Buffer Components**
- **Conservation Easements and Greenways**

The objectives of the bufferyards section are to minimize potential nuisances, provide spacing to reduce adverse impacts and to enhance the visual character of the streetscape. Dirt, litter, noise, glare, signs, odor and unsightly parking or buildings may pose as nuisances in an urban streetscape. Buffers may be used to reduce or eliminate the nuisance. See City Code Section 21.62.030 Design of Open Areas and 21.62.170 Noise.

The distinction between bufferyards and setbacks is important for this section. A setback is the minimum horizontal distance between a lot line or public street right-of-way and the nearest point of a structure or projection thereof. A bufferyard is a landscaped yard that creates separation, transition, or enhanced spacing between zoning districts, uses, or rights-of-way.

Setbacks are determined by zoning district and land use and are delineated in City Code Section 21.50 Bulk Regulations Tables. Bufferyards are set by zoning district and land use, but are not detailed in a single location. The descriptions included here intend to coalesce and simplify the most common conditions requiring bufferyards.

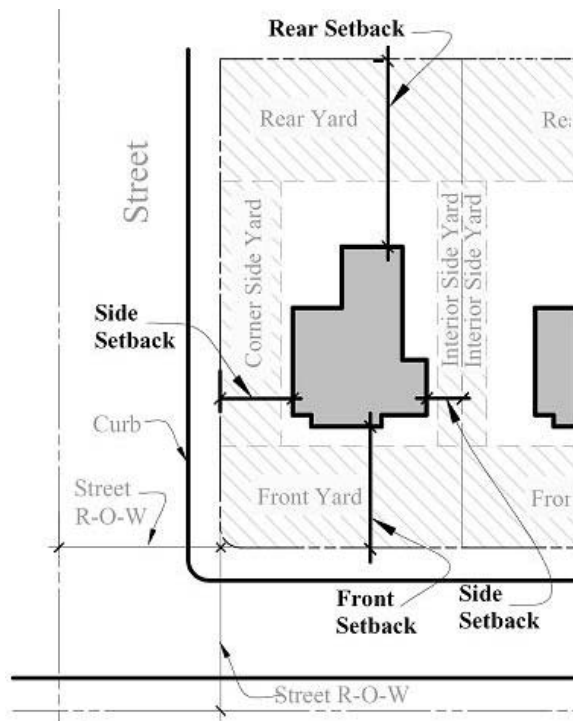
Bufferyards include property line buffers

between properties with incompatible uses of differing zoning. Right-of-way buffers separate development from the right-of-way, transitional yards separate non-residential uses from adjacent properties, and environmental planting screens (addressed in City Code Section 20.24.160, not in the Manual) buffer double frontage lots and side yards from the right-of-way in subdivisions.

Guidance related to landscape buffers relates primarily to the goals of context, visual excellence and livability.

Principles

- 1) Minimizing disturbance between disparate land uses fosters good relations between neighbors.
- 2) The blend of historic and modern architectural styles and land use patterns creates variable conditions and presents opportunities for functional and aesthetic buffers.



- 3) Minimizing views of parking lots from the street and other nuisances related to parking enhances public open space.
- 4) Buffer components determine the character and effectiveness of buffers. Plant selection is crucial for buffers: evergreens provide year round screening while deciduous plants do not screen in winter and tall shrubs or small trees screen views at eye level better than smaller plants. While walls and fences create a complete separation, the character is very different from planting.
- 5) Connecting to adjacent or nearby conservation easements helps to create a greenway network that is of high value to wildlife, forest health, and can potentially provide for hiking/walking trails for residents

Property Line Buffers

Property line buffers serve to separate incompatible uses and/or disparate zoning. Property line buffers consist of a vegetated area along the property line. These buffers screen views and minimize noise, odor and other potential nuisances. The width of the buffer is determined by zoning and land use.

Requirements, as Applicable

- 1) Provide a vegetated buffer in accordance with City Code Sections 17.09.090 Natural and Landscaped Buffers, 17.09.100 Landscape Standards, 21.50 Bulk Regulations, 21.62.030 Design of Open Areas and 21.62.120 Parking and Loading.
- 2) A buffer, at the time of installation, shall screen 75% of a rectangular vertical plane sufficiently high and long enough to accomplish required

screening.

- 3) Where a vegetated buffer is not feasible due to lack of space, a wall or fence shall be substituted. The wall or fence must be compatible with site and surrounding context and comply with City Code Section 17.34.010 Fences and Walls. Height is set by above screening requirements and City Code Section 17.34.010 Fences and Walls.
- 4) Where service access can be maintained, utilities and buffers are compatible.
- 5) Where high quality vegetation exists in a designated buffer area; use existing vegetation to meet buffer requirements. Do not grade or clear existing woodlands or desirable plantings unless necessary. Augment planting if necessary to achieve buffer goals.
- 6) Select plants and indicate plant spacing according to mature size so that appearance meets buffer goals.
- 7) Structures and paving are prohibited within the buffer.
- 8) Design buffers based on both functional and aesthetic considerations.
- 9) For simplicity and clarification, parking lot buffers are delineated in City Code Section 21.62.120 Parking and Loading.

Things to Consider

- 1) Where existing desirable plantings exist in a potential buffer area, such as champion trees, specimen trees, or valued native plantings, re-route new utilities around specimen plantings.
- 2) Plant new buffer with tight spacing to create a full buffer quickly. Thin plants to appropriate spacing for

mature-sized plants once they become crowded. Include maintenance plan indicating anticipated thinning time.

Right-of-Way Buffers

Right-of-way buffers separate development from the right-of-way. They consist of a vegetated area next to the right-of-way. These buffers screen views between development and the right-of-way and minimize potential nuisances such as noise, odor and other potential nuisances. The width of the buffer is determined by zoning and land use.



Requirements, as Applicable

- 1) Provide a vegetated buffer next to the right-of-way according to City Code Section sections 17.09.090

Natural and Landscaped Buffers, 17.09.100 Landscape Standards, 21.50 Bulk Regulations, 21.62.030 Design of Open Areas and 21.62.120 Parking and Loading.

- 2) A buffer, at the time of installation, shall screen 75% of a rectangular vertical plane sufficiently high and long enough to accomplish required screening.
- 3) Where a vegetated buffer is not feasible due to lack of space, a wall or fence shall be substituted. The wall or fence must be compatible with site and surrounding context and comply with City Code Section 17.34.010 Fences and Walls and Section 21.60.070 Fences and Walls.
- 4) Where high quality vegetation exists in a designated buffer area, use existing vegetation to meet buffer requirements. Do not grade or clear existing woodlands or desirable plantings unless necessary. Augment planting if necessary to achieve buffer goals.
- 5) Select plants and indicate plant spacing according to mature size so that appearance meets buffer goals.
- 6) Design buffers based on both functional and aesthetic considerations.
- 7) Structures and paving are prohibited within the buffer.
- 8) For simplicity and clarification, right-of-way buffers are delineated in City Code Section 21.62.120 Parking and Loading.

Things to Consider

- 1) Where existing desirable plantings exist in a potential buffer area, such as champion trees, specimen trees

or valued native plantings, re-route new utilities around specimen plantings.

- 2) Plant new buffer with tight spacing to create a full buffer quickly. Thin plants to appropriate spacing for mature-sized plants once they become crowded. Include maintenance plan indicating anticipated thinning time.



Transitional Yards

Transitional yards buffer lots in nonresidential zoning districts from other lots. They consist of a vegetated area along the property line. Generally, a transitional yard is wider than other property line buffers because non-residential land uses are more likely to have an impact on neighboring properties than residential land uses. Transitional yards aid in screening views, reducing noise, odor, pollution and other potential nuisances. The dimensions of a transitional yard is determined according

to City Code Section 21.50 Bulk Regulations.

Requirements, as Applicable

Provide a transitional yard according to City Code Chapter 21.50 Bulk Regulations. Refer also to City Code Section 21.62.030 Design of Open Areas.

A transitional yard shall not contain structures other than screening, walls, fences or planting as indicated by Code. In most instances buffer plantings and utilities are compatible uses for the same space. Code indicates otherwise with the assumption that service access may be impeded. Where service access may be maintained, utilities and buffers are compatible.

Where high quality vegetation exists in a designated transitional yard, do not remove. Do not grade or clear existing woodlands or desirable plantings unless necessary to achieve transitional yard goals.

Design transitional yards based on both functional and aesthetic considerations.

Buffer Components

Buffers serve to screen and enhance lot borders and preserve the separation from and integrity of adjacent lots.

Requirements, as Applicable

- 1) Provide a buffer according to the desired function of the buffer and City Code Section 17.09.090 Natural and Landscaped Buffers. Refer also to City Code Section 17.09.100 Landscape Standards, 20.24.160 Environmental Planting Screens, 21.50 Bulk Regulations, 21.62.030 Design of Open Areas and 21.62.120 Parking and Loading.

- 2) A buffer, at the time of installation, shall screen 75% of a rectangular vertical plane sufficiently high and long enough to accomplish required screening.
- 3) Diversify species for landscape interest and health.
- 4) Select species from the approved plant list.
- 5) Select species and design layout to address aesthetic and functional issues.
- 6) Buffers less than 10' wide shall contain a combination of ornamental/evergreen trees and shrubs or shrubs alone. Spacing shall average a minimum of one evergreen/ornamental tree per 10 linear feet and a minimum of one shrub per 3 linear feet.
- 7) Buffers 10' to <15' wide shall average a minimum of one shade tree per 25 linear feet of the buffer with understory shrub planting and a minimum of one evergreen/ornamental tree per 10 linear feet, located in clusters to provide diversity. Provide additional plants as needed to create a screen as described above.
- 8) Buffers 15' and wider shall average a minimum of one shade tree per 12 linear feet of the buffer with understory shrub planting and a minimum of one evergreen/ornamental tree per 8 linear feet, located in clusters to provide diversity. Provide additional plants as needed to create a screen as described above.
- 9) Additional plant material may be required for buffers wider than 25', if existing or proposed topographic conditions do not adequately screen the site.
- 10) Two evergreen/ornamental trees may be substituted for one shade tree.
- 11) Where a vegetated buffer is not feasible due to lack of space, a wall or fence shall be substituted. The wall or fence must complement the architectural character of the site and surrounding area.
- 12) Walls and fences must comply with City Code Section 17.34.010 Fences and Walls. Height is set by above screening requirements and City Code Section 17.34.010 Fences and Walls.

Things to Consider

Stagger distance of shade trees from edge of buffer to decrease competition for soil volume and resources for shade trees.

Conservation Easements and Greenways

Conservation easements protect the vegetated buffers and open space on a project site, and can help to integrate them with the City's greenway network.

Requirements, as Applicable

- 1) The property owner will need to conduct regular maintenance to ensure the good health of the easement's resources.
- 2) Trees cannot be cleared in conservation easements unless otherwise approved by the City Environmentalist and the Annapolis Conservancy Board
- 3) Conservation easements are inspected on an annual basis by the Annapolis Conservation Board to ensure that the easement restrictions and agreements are adhered to.

Recommendations

- 1) All easements should be given to the Annapolis Conservancy Board for oversight of management and to ensure the easement restrictions are being adhered to. Board members conduct annual inspections of the property to ensure compliance and to review any management issues or concerns with the owner.
- 2) Conservation easements should be at least 50' wide, with 100'-300' being even better from a habitat and forest health standpoint.
- 3) There should be connectivity between on-site easements and any easements adjacent to the property. This helps to ensure the creation of a greenway network that is a benefit to local wildlife and forest health.
- 4) No rear-lot easements. Rear lot easements are difficult to manage because the homeowners assume this is their back yard, which leads to encroachment issues. These rear-lot vegetated areas are important features, but should not be placed into a conservation easement.
- 5) Signs should be posted on the perimeter of the easement, clearly indicating the area is preserved for forest conservation purposes. The Annapolis Conservancy Board has a standard sign that is used on City conservation easements.

Planting

- **Tree Selection**
- **Tree Planting Requirements**
- **Planting Design**
- **Shrubs**
- **Groundcovers**
- **Urban Tree Planting Areas**
- **Open Space and Park Planting**

The objectives of the planting section are multiple and valuable to consider at two different scales: the scale of the site and the scale of the City or neighborhood. Related to the scale of the site, Section 21.62.040 of the City Code says, “Planting shall be provided within the site in order to integrate a building into the overall site design, soften the mass of the building and separate the building from the parking area. Building area planting shall be located in order to be visible from adjacent streets.” The same section of code mentions tree preservation, vegetation stand preservation and minimizing lawn areas as planting objectives.

At the scale of the City, the Annapolis Comprehensive Plan expresses the City’s commitment to increase tree canopy cover to 50% by 2036 (from approximately 42% in 2009). Additionally objectives at the scale of the City include enhancing public spaces and recreation areas; providing continuity within a neighborhood and diversity between neighborhoods; and providing distinction between residential and commercial districts and between roads of differing traffic volumes.

Several objectives relate to both scales,

including preserving or developing neighborhood context, improving aesthetic qualities, distinguishing public spaces from private spaces and considering context.

Some objectives related to the site overlap with those related to the City in that maximizing planting efforts is necessary to help plantings thrive, including proper planting techniques; compatibility of plants and locations; optimizing conditions and adequate maintenance.

Planting guidance relates primarily to the goals of sustainability, context, visual excellence and livability.

Principles

- 1) Native and naturalized species require less maintenance, have fewer pest problems and do not require irrigation. Invasive and/or exotic species crowd out native species and decrease biodiversity.
- 2) Increased tree canopy is linked to increased air and water quality.
- 3) Planting design allows individual expression, creation of a connection to a larger aesthetic, solving landscape problems, and achieving functional goals for a site or within a neighborhood.
- 4) Planting design decisions collectively affect the aesthetic quality of a community.
- 5) Good planting design acknowledges and allows for changes over time.
- 6) The City of Annapolis has set a target of 50% tree canopy cover by the year 2030. An increase in planting will be necessary to achieve this goal.
- 7) Planting design is a human creation,

providing aesthetics and solutions based on current knowledge of ecosystems and interactions.

Tree Selection

Selecting the appropriate tree for the site impacts longevity and vigor of the tree and, ultimately, the success of the landscape.

Requirements, as Applicable

- 1) Select trees with habits that address their intended use. Appropriate species for use as street trees may not be right for buffer plant material or for other design goals. Select trees that are appropriate for the specific application and site conditions.
- 2) For species guidelines for tree selection refer to plant lists in the Appendices. See also City Code Section 14.12.120 Species and Varieties.
- 3) Avoid trees grown in containers. Girdling roots is a common problem with container-grown trees.
- 4) Select trees that have not been planted too deeply in the nursery field. Look for a visible root flare that does not show evidence of having been (if tagging is not possible).
- 5) Unless otherwise indicated on plans, trees must be at least 1¾" diameter at 6" above ground level and at least 8 to 10 feet in height at time of planting according to City Code Section 14.12.130 Size.
- 6) Street trees must be 3" caliper 6" above ground level.
- 7) Select native species where viable; avoid invasive species. Refer to the Appendix A: Recommended Plantings, Invasive Species of

Concern in Maryland⁴¹, and Maryland Native Plant Society – Plant Resources⁴²

- 8) Tag trees individually at the nursery whenever possible. Select visibly healthy specimens. Avoid trees with root girdling, scarred trunks or signs of pests. Avoid trees that are planted or balled with an obscured or buried root flare.
- 9) Consider characteristics such as density, leaf and seed drop, fall color, flower and fragrance.
- 10) Refer also to American Standard for Nursery Stock, 2004, published by the American Nursery & Landscape Association⁴³.

Things to Consider

- 1) Use drought tolerant trees to conserve water where appropriate.
- 2) Use native species to reduce dependence on toxic fertilizers and pesticides and to increase wildlife habitat.



Nursery Specimen

Tree Planting Requirements

Correct planting technique increases the chances of plant survival by protecting structure and facilitating nutrient and water uptake.

Requirements, as Applicable

- 1) Plant appropriate species. See Appendices for plant lists and City Code Section 14.12.120 Species and Varieties.
- 2) Plant during the appropriate season according to species.
- 3) Spacing is dictated by the design, but a rule of thumb is 10' for small trees, 15' for medium trees, and 25' - 30' for large trees.
- 4) Plant trees only after finished grade and bed prep have been completed.
- 5) Plant trees in accordance with the

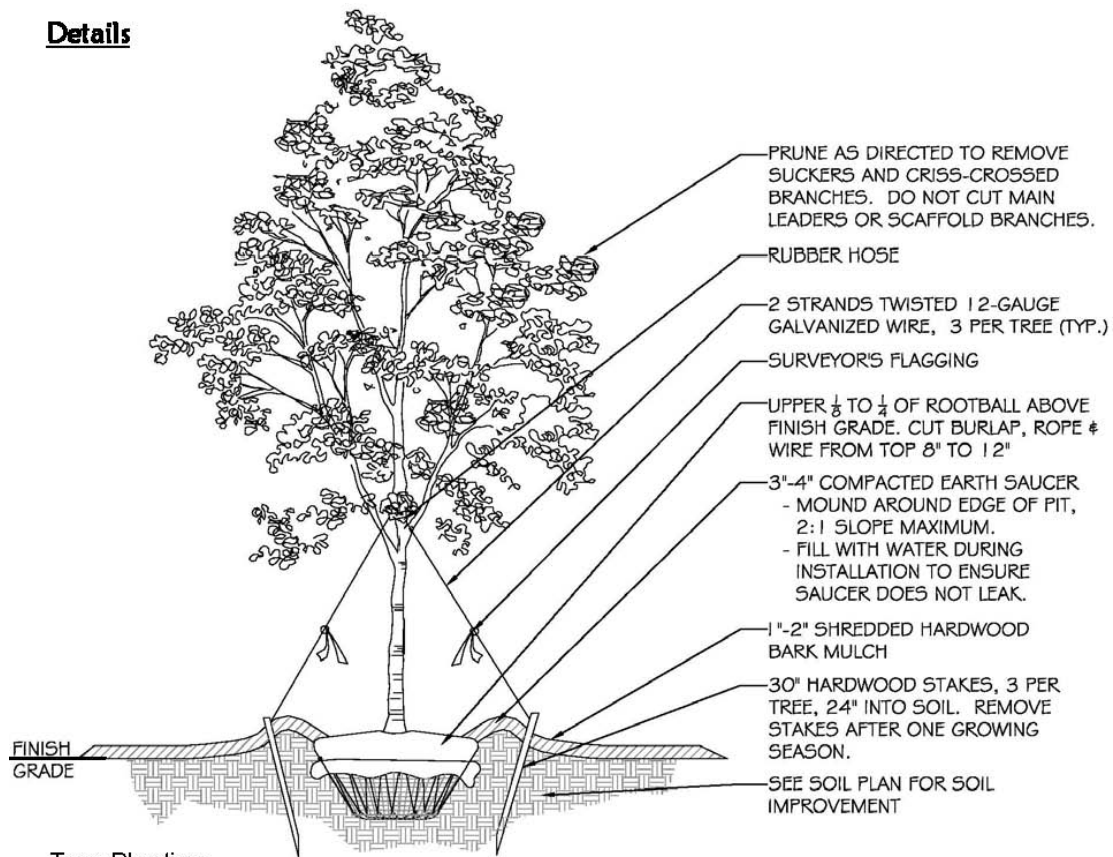
requirements shown and the current edition of Landscape Specification Guidelines, Landscape Contractors Association of MD, DC, and VA⁴⁴

- 6) Substitutions require written approval of the City representative.
- 7) Test soil to determine needed amendments.
- 8) Backfill with soil mix free of stones, subsoil, clay, lumps, stumps, roots, weeds, Bermuda grass, litter, toxic substances, or any other material which may be harmful to plant growth or hinder grading, planting or maintenance operations.
- 9) Backfill shall be well worked about the roots and settled in by watering.
- 10) The tree root flare shall be visible above soil and mulch. Burying the root flare endangers the tree.
- 11) Soil saucers at base of trees shall provide shallow basins. Avoid saucers that may retain water against the trunk.

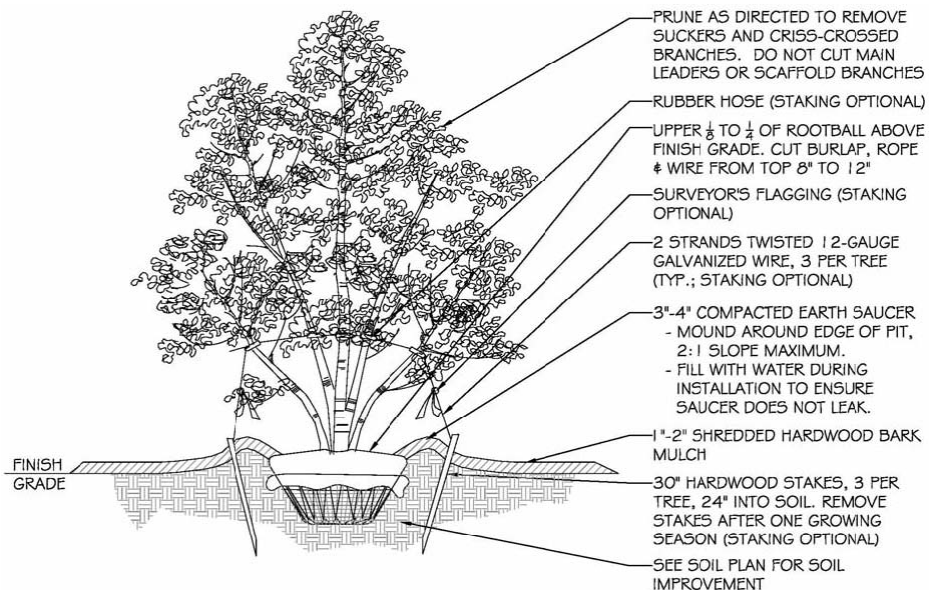
Things to Consider

Use compost tea, organic fertilizers and compost amendments to maintain soil and plants. For restrictions see City Code Section 10.34 Sale and Application of Lawn Fertilizer.

Details



Tree Planting



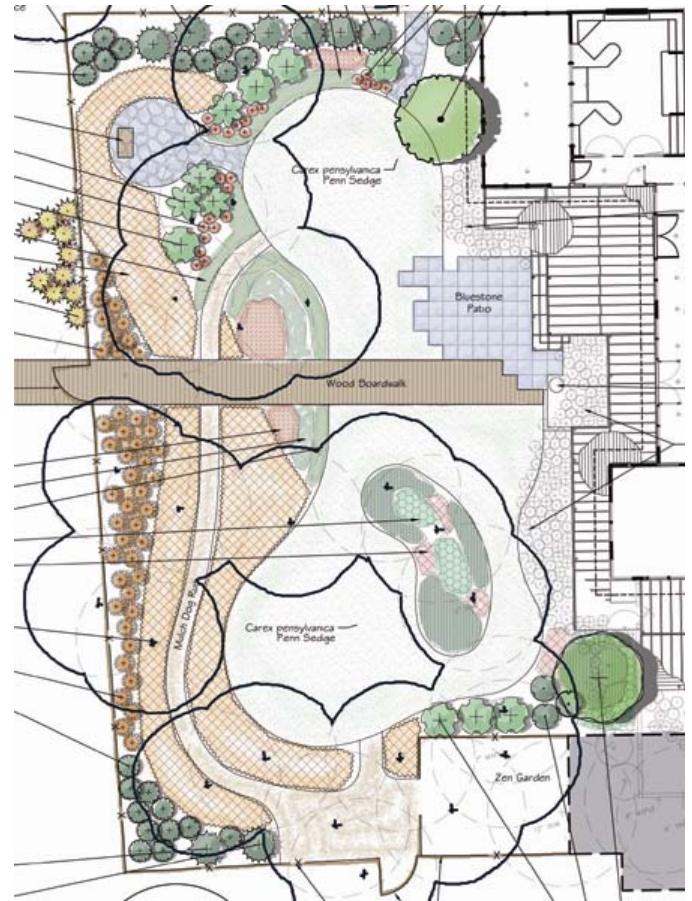
Multi-stem Tree Planting

Planting Design

Planting design refers to creating a plan with consideration for location, species selection, size of plants, spatial definition, seasonal interest, habitat creation, energy conservation, environmental and aesthetic improvements and functional requirements. These planting design guidelines are intended to assist property owners and developers in creating functional and aesthetically-pleasing planting designs.

Requirements, as Applicable

- 1) Have a survey done and/or draft a plan of site including features listed in Site Analysis.
- 2) Determine the goals of the planting design for the site based on land use, user groups and functional needs of the client. Is it a multi-use open space area for a residential development or a planting area to meet mitigation requirements or a courtyard for a corporate campus?
- 3) Identify the uses needed and the best locations for each use by considering topography, proximity to buildings or other uses, existing features, etc. See the guidelines for **Site Analysis** for other considerations.
- 4) Create a “sense of place” through differentiating spaces. Create distinct spaces based on function, frequency of use, maintenance requirements and other needs. It may help to think of each unique space as an “outdoor room.”
- 5) Provide clear paths between areas on the site. Create a circulation system.
- 6) Avoid placing incompatible uses next to each other. Provide distance or other buffers/screening between uses that may conflict.
- 7) Create multi-use areas where possible, such as in housing developments, where a single lot may be used for several purposes such as a play area, bird watching/birdfeeder, seating area, vegetable or flower garden, and utilities and storage.
- 8) In areas farther from buildings and in areas of lower use, use plants that will require little maintenance. Meadows and other naturalized plantings are appropriate for property edges.
- 9) Use plant features to create



character in a space. For instance, highlight interesting tree bark, upright narrow structure or fine leaves that move in the breeze by placing those plants in prominent locations.

- 10) Locate specimen plantings in high traffic areas or areas of significant exposure.
- 11) Use bloom color, bloom time and massing to maximize visual impact.
- 12) Take advantage of view sheds by planting ornamentals at focal points or by using plants to frame views.
- 13) For large canopy trees select areas with optimal soil conditions (high soil volume, high fertility, good drainage, appropriate organic matter content, etc.).
- 14) Plant deciduous shade trees on the southwest and southeast sides of buildings to provide shade, which will save energy, especially in warmer months.
- 15) Plant trees near paved areas to reduce urban heat island effect and shade pedestrian walkways.
- 16) Use “friendly” plants near walkways—plants that won’t scratch or irritate pedestrians. Also consider leaves, seeds, and fruit drop near pedestrian areas, dining areas and swimming pools.
- 17) Use root barriers to protect paving.
- 18) Layer plants to create vertical and horizontal richness.
- 19) Protect natural resources through design. For instance, plan a buffer strip near water bodies to minimize runoff entering the water and to provide soil stabilization.
- 20) Select plant species based on soil compatibility, pH tolerance, climate compatibility, pollution tolerance, moisture absorption and/or tolerance of inundation.

21) Select species that perform well in the microclimate of the site, with minimal negative environmental impact.

22) Provide species diversity. On sites with more than one tree select at minimum 2 distinct genera. One should be *Quercus*, *Platanus*, *Acer*, *Liriodendron* or *Ulmus*. On sites over 5,000 sf provide a minimum of 3 genera. See Appendix A for species.

23) Adjust spacing to allow for driveways, lights and utility requirements.

24) Use the given spacing for trees:

- Large trees – 35’ min. and 50’ max.
- Medium trees – 25’
- Small trees – 15’

25) For planting requirements by lot see Appendix A: Recommended Plantings.

Things to Consider

- 1) Plant for pollinators and other wildlife.
- 2) Plant edible landscapes that will continue to bear fruit in future years.
- 3) Plant in naturalistic forms, mimicking nature for more informal appearance and geometric, asymmetrical or evenly spaced configurations for a more formal appearance.
- 4) Plant trees (preferably deciduous trees) on the southwest and southeast sides of buildings close enough to shade buildings in summer for maximum energy savings.

Shrubs

Correct planting methods increase the chance of plant survival by protecting

structure and facilitating nutrient and water uptake.

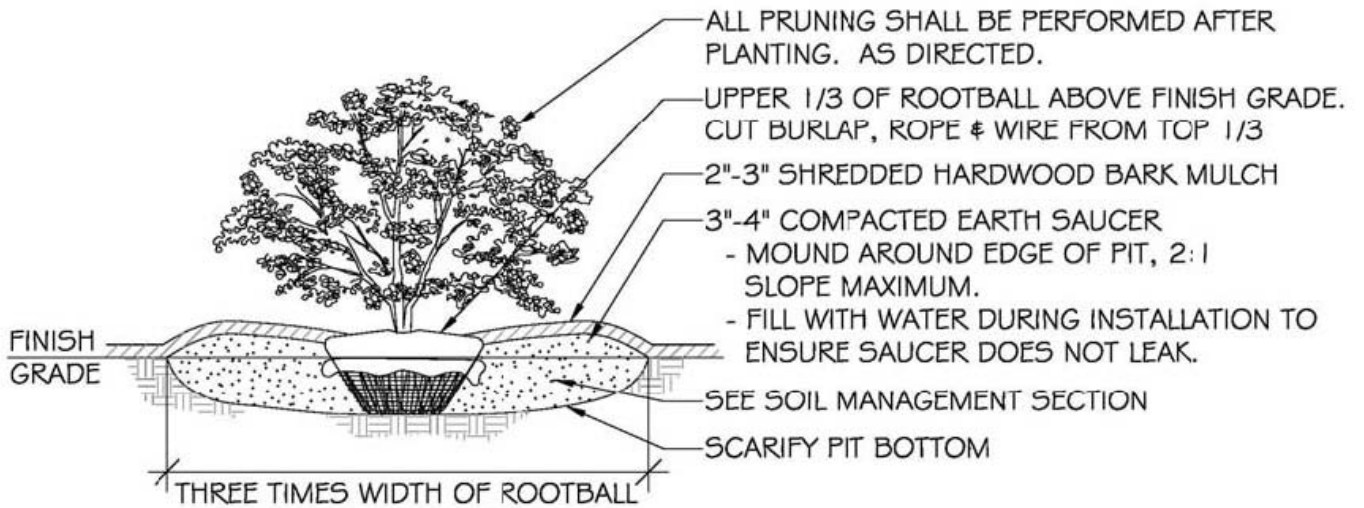
Requirements, as Applicable

- 1) Plant shrubs only after finished grade and bed prep have been completed.
- 2) Test soil to determine needed amendments. See **Soil Management** section.
- 3) Plant shrubs in accordance with the requirements shown and the current edition of Landscape Specification Guidelines, Landscape Contractors Association of MD, DC, and VA⁴⁵.
- 4) Plant shrubs 1 inch higher than surrounding grade.
- 5) Backfill with soil mix free of stones, subsoil, clay, lumps, stumps, roots, weeds, Bermuda grass, litter, toxic substances, or any other material which may be harmful to plant growth or hinder grading, planting or maintenance operations.
- 6) Backfill shall be well worked about the roots and settled in by watering.
- 7) Prune shrubs after planting.
- 8) Plant appropriate species according to climate, soil, pH, salt/pollution tolerance and moisture levels (see Planting Design section).
- 9) Plant during the appropriate season according to species.
- 10) Indicate spacing on the plans according to anticipated mature size (use 75% to 100% of mature size).
- 11) Substitutions require written approval of the City's representative.

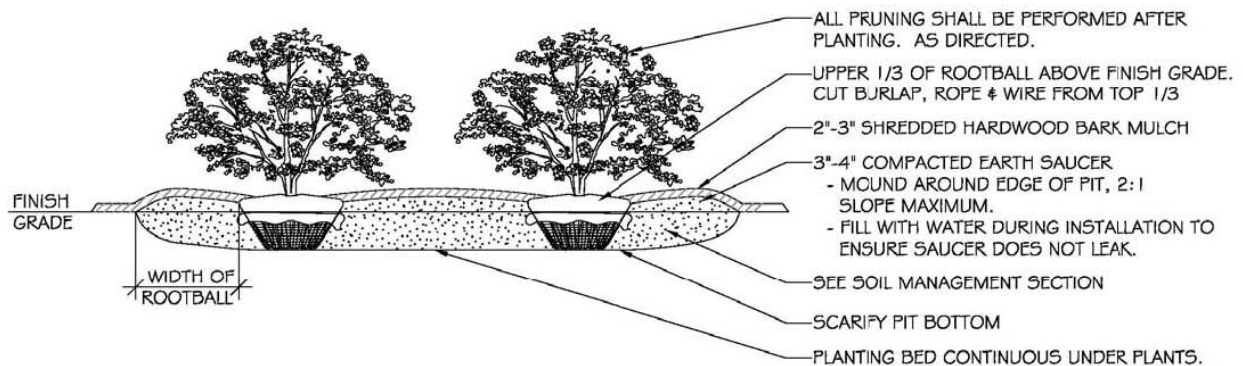
Things to Consider

Use compost tea, organic fertilizers and compost amendments to maintain soil and plants. For restrictions see City Code Section 10.34 Sale and Application of Lawn Fertilizer.

Details



Shrub



Multiple Shrubs

Groundcovers

Correct planting technique and appropriate soil moisture level during establishment increases the chances of plant survival by protecting structure and facilitating nutrient and water uptake.

Requirements, as Applicable

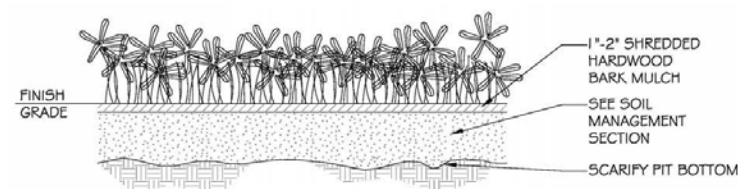
- 1) Maximum mowed turf area is 25% of non-paved site areas. See the Planting Design section.
- 2) Test soil to determine needed amendments. See **Soil Management** section.
- 3) Plant groundcover only after finished grade and bed prep have been completed.
- 4) Plant shrubs in accordance with the requirements shown and the current edition of "Landscape Specification Guidelines", Landscape Contractors Association of MD, DC, and VA⁴⁶.
- 5) Backfill with soil mix free of stones, subsoil, clay, lumps, stumps, roots, weeds, Bermuda grass, litter, toxic substances, or any other material which may be harmful to plant growth or hinder grading, planting or maintenance operations.
- 6) Backfill shall be well worked about the roots and settled in by watering.
- 7) Plant appropriate species according to climate, soil, pH, salt/pollution tolerance and moisture levels (see the Planting Design section).
- 8) Plant during the appropriate season according to species.
- 9) Indicate spacing on the plans according to anticipated mature size (use 75% to 100% of mature size).
- 10) Substitutions require written approval of the City's representative.



Things to Consider

- 1) Use native plants, especially in plantings that buffer water bodies in order to avoid introducing species that may be aggressive or invasive in waterways.
- 2) Use compost tea, organic fertilizers and compost amendments to maintain soil and plants. For restrictions see City Code Section 10.34 Sale and Application of Lawn Fertilizer.
- 3) Plant groundcovers to combat erosion, protect slopes and protect water quality.

Details



Groundcover Planting

Urban Tree Planting Areas

Successful street tree design enables trees to grow to maturity.



Requirements, as Applicable

- 1) Required soil volume minimum is 400 cubic feet per tree.
- 2) Incorporate tree planting areas where sidewalk width allows for a planting area and an accessible route.
- 3) Maximize tree pit size without reducing the accessible route or impeding pedestrian movement.
- 4) Continuous trenches are connected tree planting areas that maximize soil volume. An option to increase walking surface and reduce imperviousness is to use permeable paving between trees.
- 5) Provide a surface flush with grade where space is limited to avoid tripping hazards.
- 6) Where the sidewalk provides ample space for traffic flow, raised edges may be used. Contrast material and/or color of edges for visibility.
- 7) Tree pit grates and vertical tree

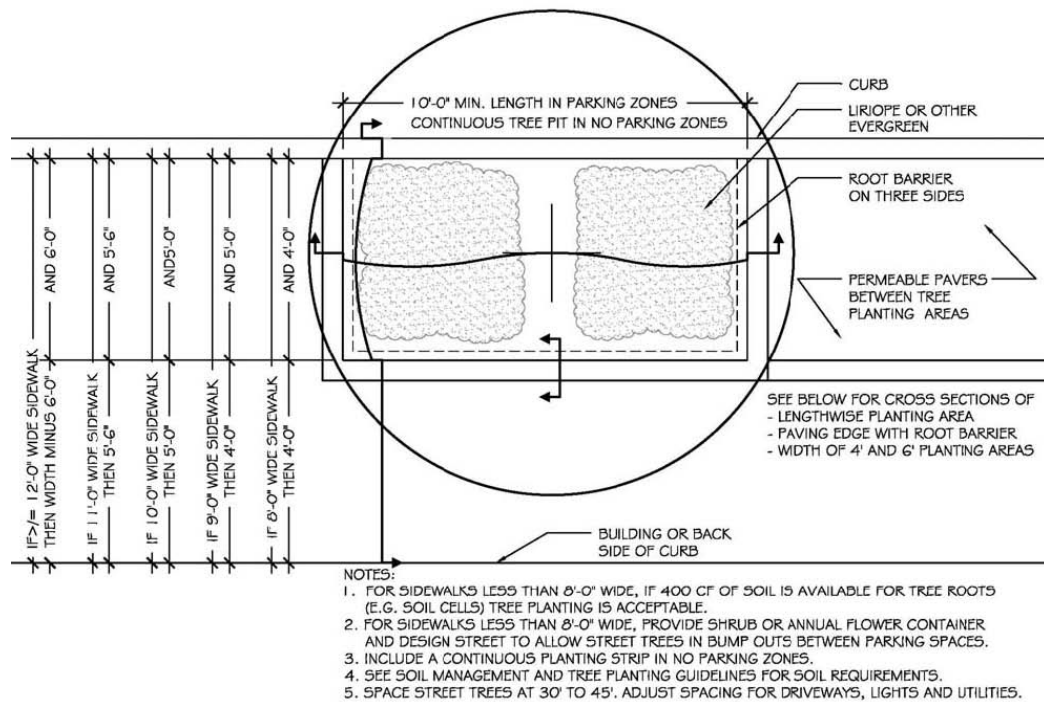
guards are not permitted.

- 8) Direct sidewalk stormwater into tree planting areas or to permeable paving.
- 9) If poor drainage is suspected perform a percolation test. (Dig a hole 12" wide by 18" deep. Fill with water. If the water has not completely drained after eight hours the soil does not drain well.) If drainage is poor provide drainage to the storm drain system or drill 6" diameter holes 24" apart into the free-draining strata or to a depth of 10 feet, whichever is less, and back fill with free-draining material.
- 10) Adequate drainage is critical to success of urban trees. Selecting a tree species compatible with the planting site soil characteristics increases the potential for tree success.
- 11) Provide root barriers on three sides of tree pit to prevent damage to the paving by tree roots. The barrier should be black molded modular panels 18" wide, manufactured from 50% recycled polyethylene plastic 85 mils thick with an ultraviolet inhibitor and vertical root deflecting ribs protruding $\frac{3}{4}$ " out from the panel.
- 12) In planting strips if tree is less than 10' from the paving edge, provide a 10' long root barrier (centered on the tree) at the paving edge.

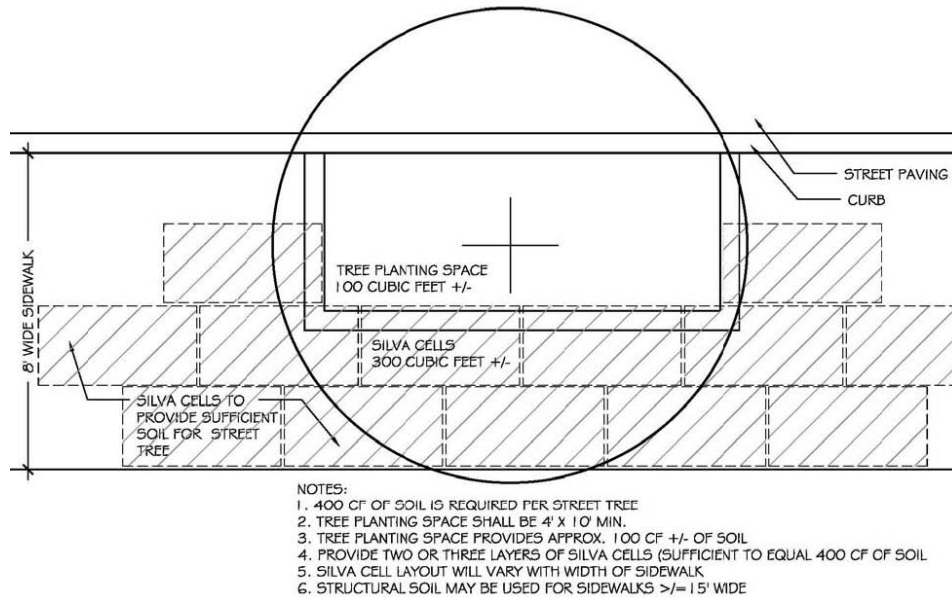
Things to Consider

- 1) Use soil cells or structural soil for subsurface support system to provide connectivity between tree pits, access increased soil volume, and incorporate utilities.
- 2) Use de-icing products that are environmentally neutral.

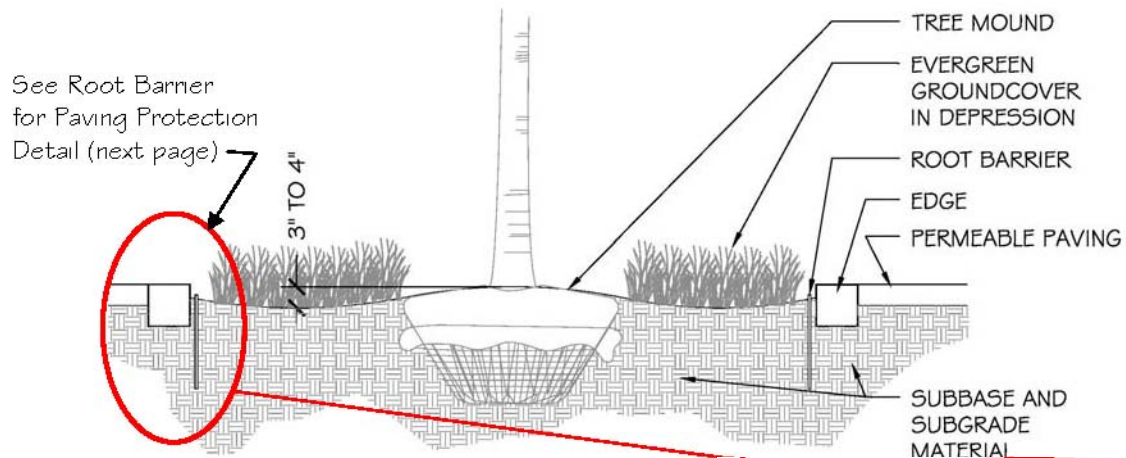
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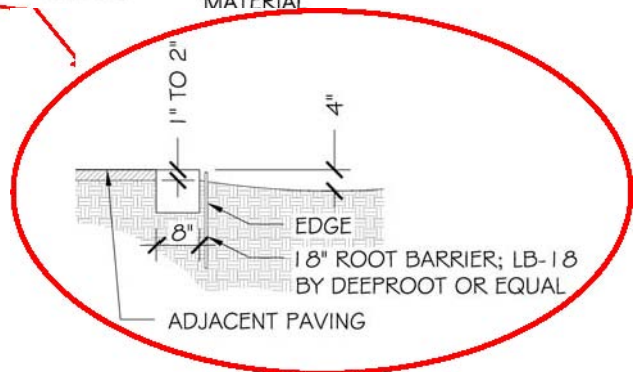
Commercial District – Tree Planting Area with Sidewalk and Dimensions



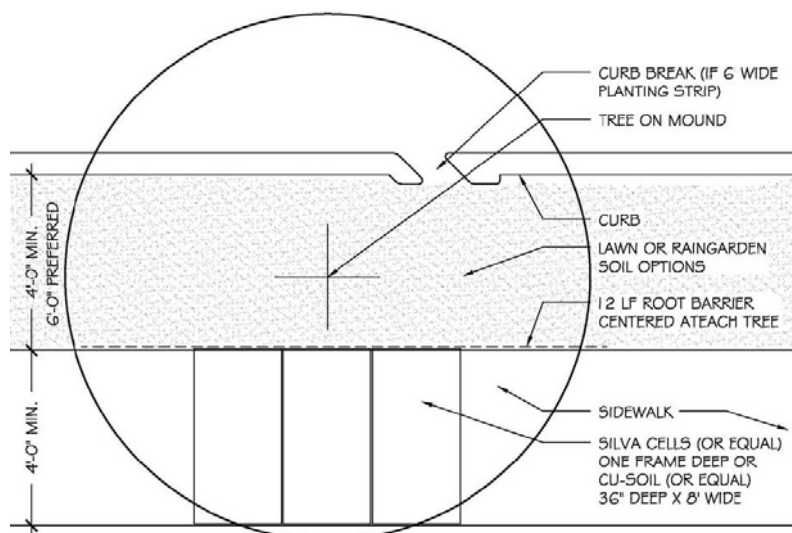
Commercial District – Tree Planting Area Layout with Silva Cells (or equal)



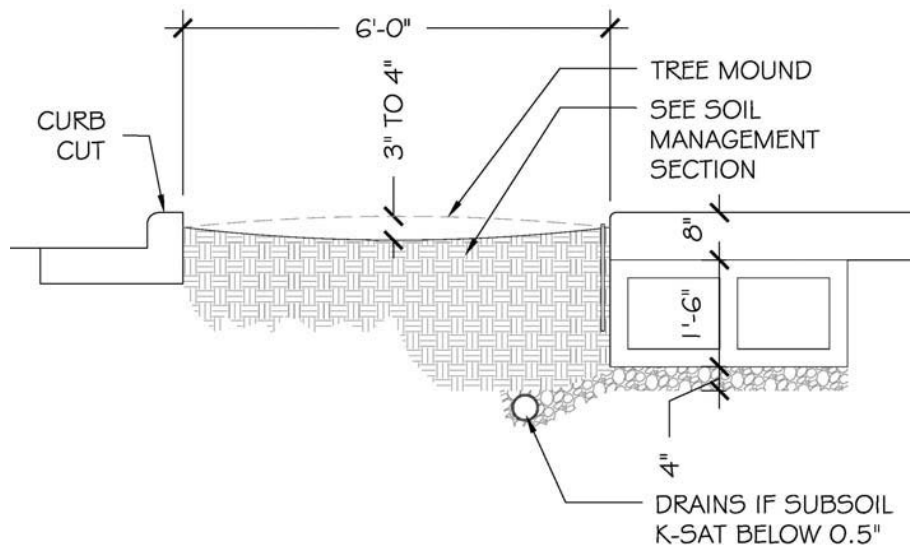
Commercial Districts
Lengthwise Cross Section of Tree Planting Area



Cross Section of Paving Edge and Root Barrier

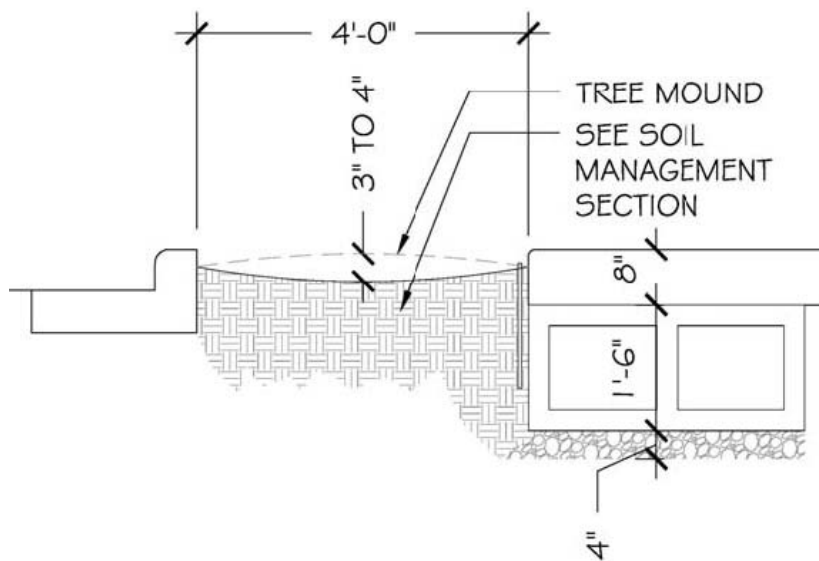


Residential District –
Tree Planting Strip Layout with Silva Cells (or equal)

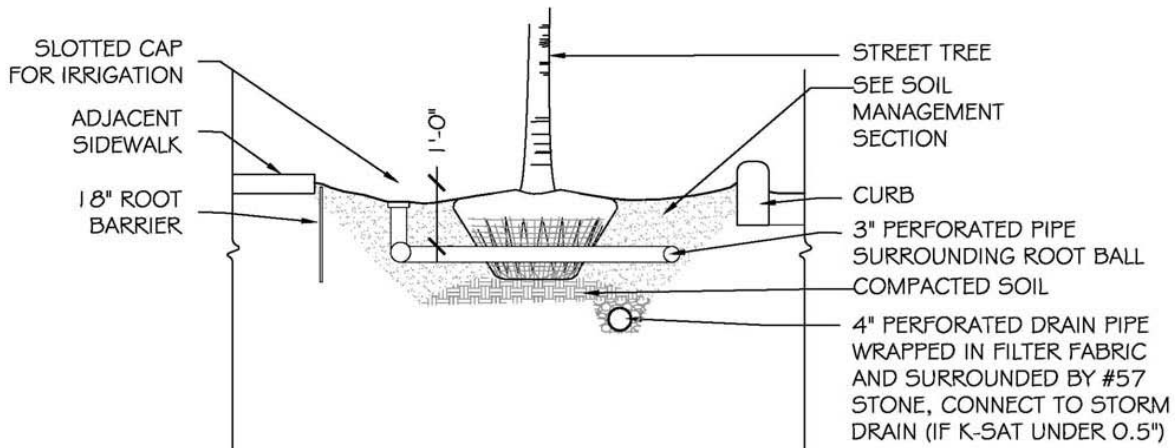


Residential Districts

Cross Section of 6' Wide Tree Planting Area



Residential Districts Cross Section of 4' Wide Tree Planting Area



Cross Section of Tree Well with Drainage in Restricted Space (Pertains to All Areas)

Open Space and Park Planting

Open space and parks complement neighborhoods, open up dense urban areas, offer gathering spaces, and provide places for rest, reflection and appreciation of nature, climate and beauty.

Requirements, as Applicable

- 1) Provide a planting design to complement site features: geology, hydrology, vegetation, wildlife, habitat, history and culture, etc. Refer to City Code Section 21.62.030 Design of Open Areas.
- 2) Use large tree species for shade.
- 3) Use small tree species to create a pedestrian scale in areas of pedestrian pathways and intimate gathering spaces.
- 4) Plant low litter trees and

nonirritating/thornless plants around children's play areas, seating areas and high traffic areas.

- 5) Use plants to delineate spaces and create a sense of place.
- 6) Regenerate and restore landscapes. Incorporate all facets of the ecological system into the design: protect natural hydrology, recreate native plant associations and habitat. Return a disturbed landscape to a more balanced one.

Things to Consider

Employ demonstration areas for sustainable materials, integrated stormwater management, native plants, low impact development, native plant associations with reconstructed or renewing habitat, etc.

Utilities and Service Areas

- **Waste Storage and Disposal Enclosures**
- **Utility Service Enclosures and Access**

The objective of the section related to utilities and service areas is to provide adequate facilities that are contextually complementary and minimize impact to the site and surrounding neighborhood. This includes visual and other potential impacts.

Guidance related to utilities and service areas relates primarily to the goals of context, visual excellence and livability.

Principles

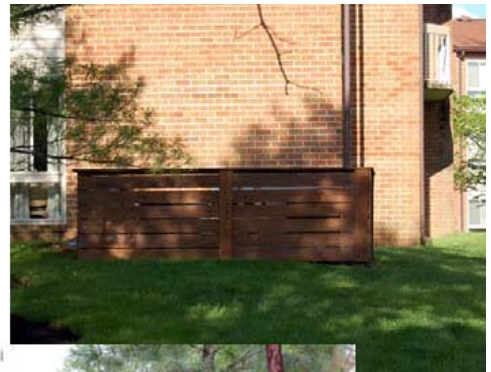
- 1) Screening waste storage and disposal enclosures promotes high quality aesthetic landscapes and to transforms a utilitarian function into an opportunity to complement architectural context.
- 2) Well-designed storage and loading facilities mesh with the site instead of overwhelming it. Unobtrusive facilities are preferred.
- 3) Storage and loading facilities provide opportunities to transform utilitarian functions into complementary architectural features.

Waste Storage and Disposal Enclosures

Waste storage and disposal enclosures can detract or complement neighborhood context.

Requirements, as Applicable

- 1) Provide an enclosure that complements neighborhood context and enhances the aesthetic of the streetscape or open space according to City Code Section 21.62.180 Storage, Loading, and Service Areas and other sections in Chapter 21.62 Site Design Standards. Provide waste storage according to 21.62.160 Waste Disposal.



- 2) Locate enclosure in an inconspicuous location on the site, preferably not visible to pedestrian or vehicular traffic.
- 3) Enclosure walls or fences must be constructed of attractive, durable, low maintenance, damage-resistant, noncorrodible, nonabsorbent materials that are compatible with site and surrounding architectural features.
- 4) Enclosure materials in the Historic District and other overlay districts

must meet with approval from the appropriate commission or overseeing authority. See City Code Title 17 Buildings and Construction and Chapter 21.56 Historic District.

- 5) Corrugated metal, corrugated fiberglass, sheet metal, chain link and wire mesh are discouraged and must be approved before use.
- 6) Moving parts on enclosure doors or gates shall be durable. Wooden doors that open outward are not acceptable.
- 7) Use anti-graffiti finish on walls and metal fences.
- 8) Enclosures are subject to setback requirements.
- 9) Enclosures may not disrupt stormwater flow.
- 10) Where possible use plants to screen waste storage and disposal enclosures. Evergreen trees and shrubs are preferred. In tight spaces use fences or walls (subject to review).
- 11) Integrate storage and loading with other features of the site.
- 12) If storage and loading facilities are visible from surrounding areas, screen with plants. Evergreen trees and shrubs are preferred. In tight spaces use fences or walls (subject to review).

Things to Consider

- 1) Select elements with recycled content.
- 2) Storage and loading facilities serve many purposes including concentrating service access to a building, separating service equipment and activities from the primary land use and providing a separate and discreet area that

does not interfere with customers' access. The challenge comes in ensuring these facilities do not detract from the site aesthetics or the neighborhood context.

Utility Service Enclosures and Access

Frequently, utility service enclosures and access address public health and safety issues. Providing access while minimizing impact to the site requires an integrated and contextually-sensitive solution.

Requirements, as Applicable

- 1) Provide enclosures and access to complement the streetscape and the neighborhood context according to City Code Section 21.62.150 Utility Services and other sections of Chapter 21.62 Site Design Standards. Also refer to City Code Sections 21.62.180 Storage, Loading, and Service Areas and 21.62.160 Waste Disposal.
- 2) Integrate utilities with other features of the site.
- 3) If possible, locate utilities and access in an inconspicuous location on the site, preferably not visible to pedestrian or vehicular traffic.
- 4) Provide clear, unobstructed access to utilities.
- 5) Cluster utilities together if possible and provide combined enclosures.
- 6) If utility service enclosures and access must be in a prominent location, screen views. Consider site and surrounding area views.
- 7) Where possible, screen utility service enclosures and access with plants. Evergreen trees and shrubs are preferred.

- 8) For enclosures $\geq 4'$ tall, provide full screen (based on mature size of plants) up to 6' high.
- 9) For enclosures $< 4'$ tall, provide full screen (based on mature size of plants) up to 4' high.
- 10) In tight spaces use fences or walls (subject to review).
- 11) Enclosure walls or fences must be constructed of attractive, durable, low maintenance, damage-resistant, noncorrodible, nonabsorbent materials that are compatible with site and surrounding architectural features.
- 12) Corrugated metal, corrugated fiberglass, sheet metal, chain link and wire mesh are discouraged and must be approved before use.
- 13) Enclosure materials in the Historic District and other overlay districts must meet with approval from the appropriate commission or overseeing authority. See City Code Section Title 17 Buildings and Construction and Chapter 21.56 Historic District.
- 14) Moving parts on access gates or doors shall be durable.
- 15) Enclosures are subject to setback requirements.
- 16) Enclosures may not disrupt stormwater flow.

Lighting

- **Lighting Fixtures**
- **Light Sources**
- **Light Pollution**

The objectives of the lighting section are to preserve and complement context, provide consistent lighting performance while allowing flexibility where appropriate, reduce energy consumption, reduce light pollution, promote safety, provide district or neighborhood distinction where possible, improve aesthetics and avoid creating lighting nuisance situations.

Lighting guidance relates primarily to the goals of sustainability, context, visual excellence, livability and safety.

Principles

- 1) Cool light generally produces higher contrast and is preferred for task lighting while warm light is generally preferred for indoor residential lighting because of its “softer” character.
- 2) Exterior light source selection requires consideration of several factors including color spectrum, contrast and color perception, efficiency and deterioration of the lamp over time.
- 3) Safety in lighting depends less on the number of light fixtures and the brightness of the light and more on the four listed factors and as outlined in Exterior Lighting for Energy Savings, Security, and Safety by EE Richman:
 - horizontal illuminance
 - vertical illuminance
 - uniformity/shadows

- glare

- 1) Liability related to safety generally relates to illumination below IESNA-recommended levels, illuminance insufficient for security camera effectiveness and poorly maintained light fixtures.
- 2) Certain conditions may require enhanced lighting, such as high crime areas.

Requirements, as Applicable

- 1) Provide lighting for safety and comfort. Minimize building façade, exterior and landscape lighting that does not contribute to safety while minimizing energy output.
- 2) Provide lighting in parking lots sufficient for safety but not to the point of creating a nuisance. See City Code Section 21.62.140 Lighting.
- 3) Do not exceed lighting power densities as defined in ANSI/ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda)⁴⁷ for exterior areas according to classified zone (see Light Pollution section). Refer to Chapter 17.14 Green Buildings and 21.62 Site Design Standards.
- 4) Meet exterior lighting control requirements from ANSI/ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda) Exterior Lighting Section, without amendments.
- 5) Refer to LEED 2009 for New Construction and Major Renovations --Sustainable Sites, Credit 8 Light Pollution Reduction⁴⁸ and Sustainable Sites Initiative⁴⁹.
- 6) Provide full-output lighting during defined operating hours only. Reduce light output or turn off during

off hours.

Things to Consider

Bluish-white spectrum light, or cool light, has a high correlated color temperature while red spectrum light, or warm light, has a low correlated color temperature.

Lighting Fixtures

Light fixtures are a significant element in the character of a streetscape and neighborhood.

Zoning districts or overlay districts within Annapolis may have or may adopt guidelines or requirements related to light fixtures. Lighting fixtures are functional and aesthetic. They are architectural elements, wayfinding features, and safety measures.

Requirements, as Applicable

- 1) Complement context through light fixture selection. Survey lighting and architectural style and materials in the surrounding area for inspiration. Refer to City Code Section 21.62.020 General Design Standards.
- 2) Light source height above grade for pedestrian areas shall be 8' to 10' and light source height for vehicular areas shall be 10' and up.
- 3) Historic District lighting requires review by the Historic Preservation Commission. Check with the Department of Planning and Zoning for standard characteristic light fixtures. Refer to City Code Chapter 21.56 Historic District and Building in the Fourth Century: Annapolis Historic District Design Manual, 2007.
- 4) Integrate location, height, lamp

power and light output in creating lighting design.

- 5) Follow guidelines related to light pollution, safety and lamp sources as included in the manual.

Things to Consider

- 1) Select partial to full-cutoff fixtures for all pedestrian applications.
- 2) Low wattage sources are preferred. Refer to City Code Section 2.48.350 Environmental Review Committee.
- 3) Consult a lighting professional for assistance.

Light Sources

Light source selection affects character of a landscape and site, as well as safety, through color spectrum, ambiance, potential light pollution and visual acuity.

Requirements, as Applicable

- 1) Select lamps that provide good visual acuity while conserving energy and reducing light pollution. These include, in order of efficacy and efficiency, high pressure sodium (HPS), compact fluorescent (CFL, less than 20W) and incandescent (less than 100W). Metal halide (MH) may be appropriate in some circumstances and mercury vapor is not recommended according to Practical Guide for Lighting to Reduce Light Pollution and Save Energy⁵⁰.
- 2) Use lamps that align with the intent of City Code Chapter 17.14 Green Buildings: Energy Efficiency and Environmental Design.
- 3) Select the lowest wattage that will accomplish the task. Refer to City Code Section 2.48.350

Environmental Review Committee.

Things to Consider

- 1) At the time of publishing, LED lamps are not recommended unless they are manufactured with a Correlated Color Temperature below 3000 Kelvin and limited blue light at wavelengths shorter than 500nm. This guideline is explained in Blue Light Threatens Animals and People⁵¹.
- 2) Select the most energy efficient lamps that will accomplish the task.
- 3) Minimize light pollution.

Light Pollution

Light pollution includes excessive artificial light that reduces visibility of stars and other night sky objects, in addition to creating glare, light trespass, decreased visibility and energy waste.

Requirements, as Applicable

- 1) Provide lighting for safety and comfort. Minimize building façade, exterior and landscape lighting.
- 2) Provide lighting in parking lots sufficient for safety but not to the point of creating a nuisance. See 21.62.140 Lighting.

Things to Consider

- 1) Do not exceed lighting power densities as defined in ANSI/ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda)⁵² for exterior areas according to classified zone (as defined below).
- 2) Determine IESNA RP-33 classification and follow guidelines and requirements for the individual LZ category (LZ1: Dark, LZ2: Low, LZ3: Medium, LZ4: High).

- 3) Meet exterior lighting control requirements from ANSI/ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda)
- 4) Refer to LEED 2009 for New Construction and Major Renovations --Sustainable Sites, Credit 8 Light Pollution Reduction⁵³ and Sustainable Sites Initiative⁵⁴.
- 5) Refer to City Code Chapter 17.14 Green Buildings: Energy Efficiency and Environmental Design and 21.62 Site Design Standards.
- 6) Low wattage fixtures are preferred. Refer to 2.48.350 Environmental review committee.
- 7) Safety related to lighting involves providing appropriate lighting for pathways, pedestrian areas, parking lots, outdoor facilities with evening hours and building entrances. Areas of concern based on information from law enforcement or other officials.

Things to Consider

- 1) Have a security audit performed.
- 2) Use motion sensors or automatic switches to turn off non-emergency light fixtures after hours.
- 3) Low wattage fixtures that meet criteria for uniform luminance are preferred.
- 4) Reducing light pollution has become easier as technology creates more efficient lighting features and as the industry produces fixtures with a variety of cutoff options and other controls.

Streetscape Elements and Site Furnishings

- **Paving Materials and Patterns**
- **Fences and Walls**
- **Streetscape Elements**

The objectives of the section on streetscape elements and site furnishings are to preserve context, complement context, provide consistency with flexibility, promote safety, provide district or neighborhood distinction where appropriate, enhance aesthetics and reduce clutter.

Guidance related to streetscape elements and site furnishings relate primarily to the goals of context, visual excellence, livability, cost-effectiveness and safety.

Principles

- 1) Paving materials and patterns serve as structure, aesthetic and guidance.
- 2) Paving materials and patterns set a tone and may refer to an artistic style or architectural period.
- 3) Paving material influences heat island effect.
- 4) Paving materials affect permeability and drainage on a site.
- 5) Fences and walls affect context and character of both sides of the structure, therefore, both aspects should be considered for both lots.
- 6) Urban exterior spaces need to serve multiple purposes, including circulation, safety, and comfort.



Paving Materials and Patterns

Paving materials and patterns can create or contribute to the character of a site. Additionally they can respond to context, influence environmental impact and assist with wayfinding (directing people with signs, symbols or materials).

Requirements, as Applicable

- 1) Review context for material decisions; draw from local architecture or paving for material and pattern selections. Match or complement on-site materials or adjacent sidewalks.
- 2) Check zoning codes to determine if the site is within an overlay district. If so, follow guidelines related to materials and patterns.
- 3) Use permeable pavers, which are available in many types of pavers, wherever possible and practical, with appropriate subbase and drainage requirements.
- 4) Historic District Design Guideline C.11 states about sidewalk paving materials, "Sidewalk urban paving

should be brick, or match the paving material on contiguous property. Brick should be laid in one of five traditional patterns..." See Building in the Fourth Century: Annapolis Historic District Design Manual, 2007, Chapter 4, Design Guidelines⁵⁵

Things to Consider

- 1) Use pavers with a SRI (Solar Reflectance Index) of at least 29 to minimize urban heat island effect. Refer to LEED 2009 for New Construction and Major Renovations --Sustainable Sites, Credit 7.1 Heat Island Effect: Non-roof⁵⁶.
- 2) Use recycled content and /or recyclable materials. Refer to Sustainable Sites Initiative – Chapter 5 Materials Selection⁵⁷

Fences and Walls

Fences and walls provide barriers to movement, screen objects from view, individuate spaces, provide aesthetic enhancement and contribute to architectural character and context.

Requirements, as Applicable

- 1) Integrate fences and walls with other features of the site.
- 2) Fences and walls may be installed up to, but not over the property line.
- 3) Within required bufferyards adjacent to public streets, to the extent practical in order to achieve proper screening, fences and walls shall be located towards the interior edge of the landscape buffer, rather than at the edge of the public right-of-way.
- 4) Fences and walls shall not obstruct view cones or sight visibility triangles.
- 5) Fences and walls shall not be

located to unduly obstruct light and air from neighboring properties or public ways.

- 6) The overall design and materials used for fences and walls shall be in keeping with the character and purpose for which the fence or wall is intended, and shall be compatible with other similar structures in the neighborhood.
- 7) All fences and walls shall be installed with the finished side facing out, so that posts and lateral supports are not on the side of the fence or wall which faces an adjacent property or public right-of-way, unless such supporting members are exposed on both sides due to the specific design of the fence or wall.
- 8) Except in connection with penal and correctional institutions and public utility and service uses, no fence or wall shall consist, in whole or in part, of barbed wire or similar materials designed or customarily utilized to inflict injury upon persons or animals.
- 9) Standard Maximum Height:
 - On properties within the R2-NC, R3-NC and R3-NC2 Residential Neighborhood Conservation Districts, the maximum height of a fence or wall shall be six feet, unless the fence or wall is located along a public street, in which case the maximum height of the fence or wall shall not exceed four feet.
 - The height limits in Subsection (l)(1) of this section shall also apply to properties within the WME and WMM Maritime Districts as well as the OCD Overlay District, only when a fence or wall is located along a

lot line or public street that is contiguous with an adjacent property in the R2-NC District.

- 10) Fences and walls must be constructed of attractive durable materials, with quality craftsmanship and appropriate installation sufficient to withstand weathering. Additionally the materials must be compatible with the site and surrounding architectural components.
- 11) Fence and wall materials in the Historic District and other overlay districts must meet with approval from the appropriate commission or overseeing authority. See Building in the Fourth Century: Annapolis Historic District Design Manual, 2007 -Chapter 4, Design Guidelines, C.6⁵⁸
- 12) Fences and walls shall not block pedestrian pathways.
- 13) Walls and fences shall not disrupt stormwater flow.

Things to Consider

- 1) Anti-graffiti finish is recommended.
- 2) Select elements with recycled content and installation methods that are environmentally neutral.

Streetscape Elements

Streetscape elements include:

- 1) benches
- 2) tables
- 3) chairs
- 4) bike racks
- 5) trash
- 6) recycling
- 7) ash receptacles
- 8) bollards
- 9) banners
- 10) security devices
- 11) flags/flagpoles
- 12) signage

- 13) branding features
- 14) directional features

Streetscape elements provide for the needs of pedestrians and motorists on the street and in the public, shared, exterior environment. Guidance, places of safety and conflict, resting spots, indicators of density and activity, trash collection and location identification can all be gleaned from the visual, tangible cues offered by streetscape elements. They communicate with people on the street in subtle and obvious ways how to navigate through the space and what options are available while on this street.

Additionally streetscape elements reveal the personality of a city and its values and priorities.

With all the communication and the plethora of element options available to create a streetscape, integration of the various elements is critical to maintain a clear environment free of clutter.

Requirements, as Applicable

- 1) Streetscape elements must reflect or complement the context. Consider scale. Context may relate to one block or an entire neighborhood. Consult the Annapolis Comprehensive Plan and the Department of Planning and Zoning to identify applicable overlay districts, relevant studies and guidelines.
- 2) Streetscape elements must enhance the aesthetic of the streetscape, site or open space.
- 3) Streetscape elements may not block pedestrian access or thoroughways.
- 4) Use multipurpose elements

wherever possible to save space and reduce street and/or site clutter. For instance, a trash receptacle combined with a recycling receptacle and/or an ash receptacle will save space.

- 5) Streetscape elements must be of durable materials, quality craftsmanship and appropriate installation sufficient to withstand climate and public use.
- 6) Where streetscape elements are affixed to the ground, the footing or bolting system must be capable of withstanding public traffic and use.
- 7) Provide universal access according to ADA requirements in all new construction and retrofits where possible. Refer to ADA requirements for retrofit information.
- 8) Streetscape elements in overlay districts and the Historic District must meet with approval from the appropriate commission or overseeing authority.

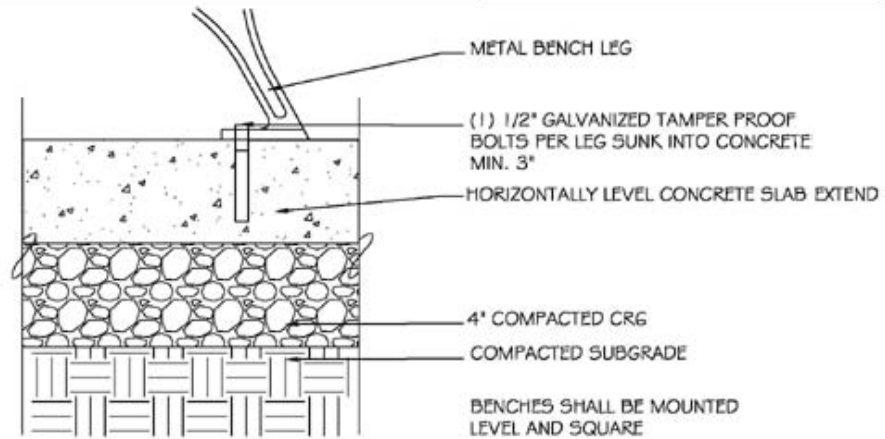
Requirements, as Applicable for specific elements

- 1) Seating: include variety in seat heights to accommodate physical differences.
- 2) Locate bike racks near building entrances where they are visible from the approach and entrance.
- 3) Select bike racks that support the frame of the bicycle and enable locking the frame and one wheel to a rack with a u-lock.

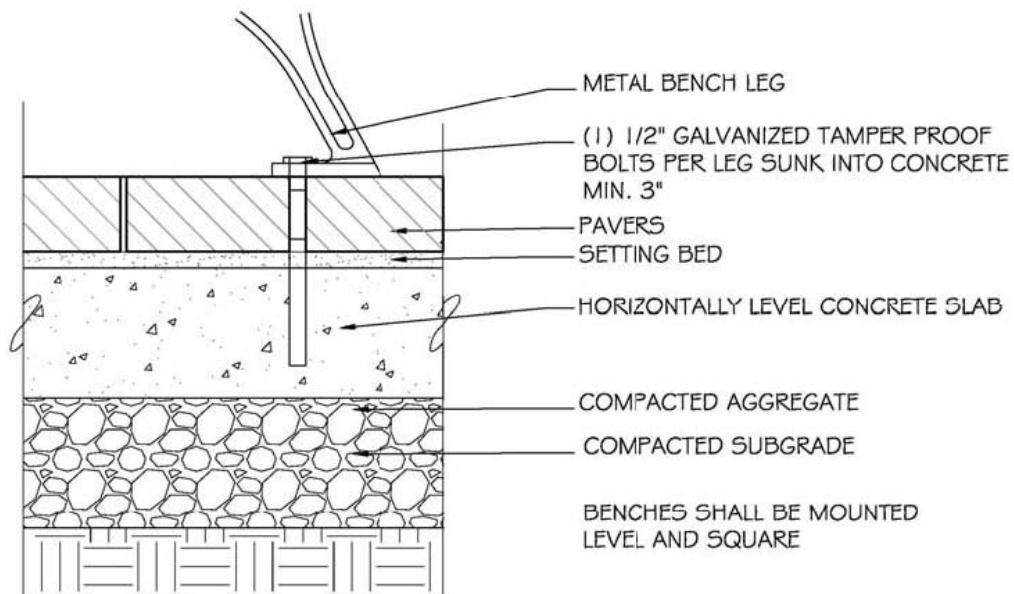
Things to Consider

- 1) Anti-graffiti finish is recommended.
- 2) Select elements with recycled content and environmentally-neutral installation methods and materials.

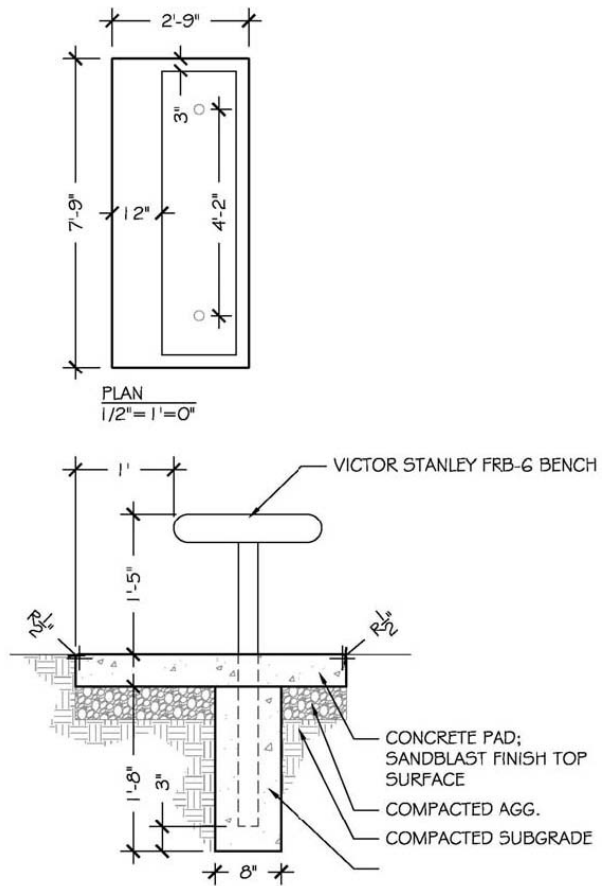
Details



Installation on Concrete with Metal Bench Leg as Example



Installation on Pavers with Metal Bench Leg as Example



Bench Installation

Glossary

Aeration - Refers to the process of using mechanized equipment to either puncture the soil with spikes or remove cores of soil from the ground (core aeration) or use an air spade for radial trenching.

Air Spade (generic term)- A pneumatic device that uses a fine stream of compressed air with sufficient pressure to displace soil and reveal root locations without damage to the roots. Identifying the location of existing roots allows construction within areas where roots are expected to exist to occur with minimal damage to critical root systems.

Aquifer- A porous water bearing geologic formation generally restricted to materials capable of yielding an appreciable supply of water.

Balled and Burlapped (B&B)- A tree or other plant dug from the ground for replanting, with roots and soil wrapped in burlap or a burlap type fabric.

Bareroot- A tree or other plant removed from the ground for re-planting without soil around its roots.

Berm- An earthen mound designed to buffer adjacent uses, screen undesirable views, reduce noise, etc.

Biodiversity- The number and variety of organisms found within a specified geographic region; the variability among living organisms on the earth, including the variability within and between species and within and between ecosystems.

Bioretention- Bioretention is a water quality practice that treats storm water in shallow depressions with plants, soils, and microbes for water quality, infiltration and filtration.

Buffer- A combination of physical space and vertical elements, such as plants, berms, fences, or walls the purpose of which is to screen incompatible land uses from each other.

Bufferyard- One of several specific combinations of minimum building setbacks, landscape yard width, and plant material requirements set forth in the **Bufferyards and Screening** section of this manual for use in buffering in compatible land uses.

Caliper- Tree diameter measured in accordance with the American Association of Nurserymen Standards.

Catchment- A catching or collecting of water, especially rainwater, in a structure, such as a basin or reservoir, used for collecting or draining water.

Check Dam- A small dam constructed in a gully or other small watercourse to decrease flow velocity (by reducing the channel gradient), minimize scour, and promote deposition of sediment.

Compaction- Compression of the soil that breaks down soil aggregates and reduces soil volume and total pore space.

Condensate- The liquid formed by the condensation of a vapor; in air conditioning, water is extracted from air.

Critical Area- Wetlands, land and water areas in the City that are within 1,000 feet measured planimetrically beyond the landward boundaries of tidal wetlands and the heads of tides.

Critical Root Zone (CRZ)- The establishment of a protected area at the base of the tree that should not be disturbed in the construction process.

Cutoff light fixture- Out door luminaires may be categorized according to the four classifications established by the IESNA of full cut off, cut off, and non-cut off to distinguish the range in quantity of upward light and light above the horizontal plane emitted by a light source.

Deciduous- A plant with foliage that sheds annually.

Drainage Area/Contributing Drainage Area- All land and water area from which runoff may run to a common point.

Drainage Media- A drainage layer consisting of rot-proof material through which water flows freely.

Drought Tolerant- A plant that is adapted to arid or drought conditions, thereby requiring little or no irrigation.

Embankment- A deposit of soil, rock, or other materials placed by humans.

Evergreen- A plant with foliage that persists and remains green year-round.

Field Capacity- Maximum soil moisture content left in soil after water is allowed to drain from the soil through the force of gravity. When the water in the soil is between field capacity and 75% of field capacity the water is easily available to plant roots. Additional water would drain freely from the soil and leach nutrients. Water levels less than 75% of field capacity are not available to the plants as they are held tightly to the soil particles.

Forest- A biological community dominated by trees and other woody plants covering an area of 10,000 square feet or greater and consisting of a tree cover ratio of 100

trees per acre with at least 50% of the trees being at least two inches in diameter at a height of 4.5 feet above the ground.

Forest Conservation- The retention of existing forest or the creation of new forest at the levels set by the forest conservation manual.

Forest Stand Delineation- An inventory of existing site conditions and forest areas and their plant associations. A Forest Stand Delineation is used for determining the most suitable and practical areas for forest conservation during development.

Fracturing (soil)- Compressed soil that tends to fracture along a definite plane.

Geotextile- Permeable fabrics which, when used in association with soil, have the ability to separate, filter, reinforce, protect, or drain.

Groundwater- Water stored underground in the pore spaces between soil particles or rock fractures.

Growing Media (Greenroof)- A material used to culture plants which is manufactured mostly of lightweight inorganic material and a small percentage of organic material so that the media will drain properly and yet retain a certain amount of rain water.

Heat Island Effect- A rise in atmospheric temperatures in urban and suburban areas due to isolating air pollutants as well as reflective heat off of buildings and paving.

Impervious Surfaces- Those surfaces in the landscape that cannot infiltrate rainfall consisting of building rooftops, pavement, sidewalks, driveways, etc.

Infiltration- The movement of water penetrating the soil surface and into the soil.

Invasive plants- A non native plant which tends to escape containment and rapidly spread in an area where there are few natural controls to its growth, resulting in a crowding out of native species or biological diversity.

LEED certification- Nationally recognized certification program by the U.S. Green Building Council for practitioners working on environmentally sustainable projects that follow the principles of Leadership in Energy and Environmental Design (LEED).

Microclimate- The climate of a small, specific place within an area as contrasted with the climate of the entire area.

Mitigation- The replacement of vegetative material to meet a particular quantity or coverage formula.

Monoculture- A continuous stand of the same plant species; a large number of the

same plants in a city or region.

Moisture Content (soil)- The weight of water, usually expressed as a percentage of the total dry weight of a material.

Native (plants)- A plant indigenous to a region. Naturally occurring and not introduced by humans.

Organic Matter Content (soil)- The total organic matter in the soil, measured as a percentage. It can be divided into three general pools: living biomass of microorganisms, fresh and partially decomposed residues (the active fraction), and the well-decomposed and highly stable organic material. Surface litter is generally not included as part of soil organic matter.

Ornamental Tree- A deciduous tree planted primarily for its ornamental value, typically smaller than a shade tree.

Rain Garden- Synonymous with bioretention, this term is typically used for marketing and general audience discussions.

Reforestation- The establishment of a forest through artificial reproduction or natural regeneration.

Runoff- Water from rain, melted snow, or irrigation that flows over the land surface.

Screening- A method of reducing the impact of visual and/or noise intrusions through the use of plant material, berms, fences and/or walls, or any combination thereof.

Setback- The distance between a building or a structure(not including ground-level parking lots or other paved surfaces) and the right of way line or property line.

Shade Tree- A tree planted primarily for its high crown of foliage or overhead canopy. A major street tree reaches 70 feet at maturity. A minor shade tree generally does not exceed a height of 40 feet.

Sight Visibility Triangle- A triangular area of unobstructed vision at a road intersection.

Soil Horizon, O and A- A soil horizon is a specific layer in the land area which measures parallel to the soil surface and possesses physical characteristics which differ from the layers above and beneath.

Horizon O: The O horizon consists of decaying organic material, if present, that is seasonally deposited by plants. This layer only exists where a continuing source of organic matter is supplied by nature or human activity. This layer is always dark brown to black.

Horizon A: The A horizon consists of a mixture of mineral soil and organic material, usually dark brown, red-brown, or yellow-brown. This is the layer typically called topsoil and is the location of most plant root activity.

Specifications- Precise written documents created to establish detail construction Methods to be carried out by contractors.

Specimen Tree- A particularly impressive or unusual example of a species due to its size, shape, age, or any other trait that epitomizes the character of the species.

Street tree- A tree planted in close proximity to a street to provide canopy over the street, to give the street a sense of spatial definition and human scale, to provide shade, and soften the street environment.

Vegetated Swale- An open vegetated channel used to convey runoff and to provide treatment by filtering pollutants and sediments.

Appendix A: Recommended Plantings

This list is not intended to be all-inclusive and is an example of acceptable varieties and species. New horticultural varieties and species are continuously introduced in the nursery industry. Trees other than those listed may be substituted with approval of the City Arborist.

- **Table I: Shade Trees**
- **Table II: Minor Shade Trees**
- **Table III: Ornamental Trees**
- **Table IV: Evergreen Trees**
- **Table V: Shrubs**
- **Table VI: Plantings Not Recommended for General Use**
- **Table VII: On Site Residential Planting Requirements Outside of the Critical Area**
- **Table VIII: References and Advisory Lists**

Table I – Shade Trees

Botanical Name	Common Name	Comments
Acer rubrum and its cultivars	Red Maple	Medium to fast growth
Fagus grandiflora	American Beech	Slow growing, smooth bark, not desired as street tree due to surface roots
Fagus sylvatica	European Beech	
Ginkgo biloba 'Princeton Sentry'	Male Ginkgo	Slow growing first 15 years then medium growing
Gleditsia triacanthos inermis	Thornless Honeylocust	Fast growing, susceptible to webworm
Liquidambar styraciflua	Sweetgum	Medium-fast growth, Fruit can be a problem, 'Rotundiloba' Fruitless variety
Liriodendron tulipifera	Tuliptree	Fast growing, weak wooded
Metasequoia glyptostroboides	Dawn Redwood	Fast growing, resistant to air pollution
Nyssa sylvatica	Black Gum	Slow – medium growth, tap root, difficult to transplant
Platanus acerifolia 'Bloodgood'	Bloodgood London Planetree	Fast growth, tolerates compaction & drought
Quercus coccinea	Scarlet Oak	Medium growth
Quercus falcata	Southern Red Oak	Medium to slow growth
Quercus palustris	Pin Oak	Medium growth, cultivars without drooping branches recommended
Quercus phellos	Willow Oak	Medium to slow growth
Quercus rubra	Red Oak	Fast growing
Quercus velutina	Black Oak	Medium - fast growth, good for sandy or clay hillsides
Taxodium distichum	Bald cypress	Medium – fast growth
Tilia americana	American Linden	Medium – fast growth
Tilia cordata 'Greenspire'	Greenspire Littleleaf Linden	Medium growing
Tilia euchlora	Crimean Linden	
Tilia tomentosa	Silver Linden	Medium growing
Ulmus americana 'Princeton'	Princeton elm	
Ulmus parvifolia	Lacebark Elm	Slow growing, high levels of resistance to dutch elm disease and insects
Zelkova serrata 'Village Green'	Japanese Zelkova	Fast growing

Table II – Minor Shade Trees

Botanical Name	Common Name	Comments
Acer buergerianum	Trident Maple	Slow – medium growth, tolerated drought
Acer capestre	Hedge Maple	Slow – medium growth, fit under most utility lines, requires limbing up for site clearances
Acer rubrum ‘Armstrong’ or ‘Bowhall’	Red Maple	Medium to fast growth, columnar varieties
Betula nigra ‘Heritage’	River Birch	Fast growing, peeling bark
Carpinus betulus ‘Fastigiata’	European Hornbeam	
Cercidiphyllum japonica	Katsura Tree	Medium – fast growth, suffers from drought and compacted soils,
Cladrastis lutea (kentukea)	Yellowwood	Medium growing, sensitive to drought & compaction
Ostrya virginiana	Ironwood	Fussy, prefers good planting conditions
Prunus sargentii	Sargent Cherry	Slow growing
Sophora japonica ‘Princeton Upright’	Upright Japanese Pagoda Tree	Slow growing, good for narrow spaces
Sophora japonica ‘Regent’	Japanese Pagoda Tree	
Tilia mongolica	Mongolian Linden	

Table III – Ornamental Trees

Botanical Name	Common Name	Comments
Acer griseum	Paperbark Maple	Slow growing, exfoliating bark,
Amelanchier canadensis	Serviceberry	Medium growing, fruit valued by wildlife
Carpinus betulus		Slow – medium growth
Carpinus caroliniana	American Hornbeam	Slow growing,
Cercis canadensis	Redbud	
Chionanthus virginicus	Fringetree	Slow growing, fruit values by wildlife
Cornus kousa	Kousa Dogwood	Slow – medium growth, more resistant to anthracnose, borers, and drought than Cornus florida
Crataegus viridis 'Winter King'	Winter King Hawthorne	Few thorns, Fruit valued by wildlife
Magnolia spp.	Magnolia	
Oxydendrum arboreum	Sourwood	
Prunus spp.	Flowering Cherry and Plum	
Styrax japonicum	Japanese Snowball	

Table IV – Evergreen Trees

Botanical Name	Common Name	Comments
Cedrus atlantica glauca	Atlas Blue Cedar	
Cedrus deodora	Deodar Cedar	
Ilex opaca cultivars	American Holly	Valued by wildlife
Magnolia grandiflora	Big Leaf Magnolia	
Picea spp.	Spruce	
Pinus spp.	Pine	
Thuja spp.	Arborvitae	

Table V – Shrubs

Botanical Name	Common Name	Comments
Abelia grandiflora	Glossy Abelia	
Azalea spp.	Azalea	
Clethra alnifolia	Summersweet	
Cornus alba cultivars	Siberian Dogwood	
Cornus stolonifera	Red-Osier Dogwood	
Cotoneaster spp.	Cotoneaster	
Euonymus spp.	Euonymus	Except for Euonymus alatus due to invasiveness
Forsythia spp.	Forsythia	
Ilex spp.	Holly	
Jasminum nudiflorum	Winter Jasmine	
Junipers spp.	Junipers	
Kalmia latifolia	Mountain Laurel	
Leucothoe spp.	Leucothoe	
Mahonia aquifolium	Oregon Grape Holly	
Mahonia baelei	Leatherleaf Holly	
Myrica cerifera	Southern Bayberry	
Myrica pennsylvanica	Northern Bayberry	
Nandina domestica	Heavenly Bamboo	
Osmanthus spp.	False Holly	
Photinia x fraserii	Frasers Photinia	
Pieris japonica	Japanese Andromeda	
Prunus laurocerasus 'Schipkaensis' or 'Otto Lutyken'	Cherry Laurel	
Pyracantha spp.	Firethorn	
Rhododendron spp.	Rhododendron	
Spiraea spp.	Spirea	Except for Spirea japonica due to invasiveness
Taxus spp.	Yew	
Viburnum spp.	Viburnum	
Weigela spp.	Weigela	

Table VI – Plantings Not Recommended for General Use

Botanical Name	Common Name	Comments
Trees		
<i>Acer negundo</i>	Boxelder	Invasive, short-lived, weak wood
<i>Acer platanoides</i>	Norway Maple	Dense shade & surface roots
<i>Acer pseudoplatanus</i>	Sycamore Maple	Invasive, Cankers, Subject to dead wood
<i>Acer saccharinum</i>	Silver Maple	Fast growing, Brittle Branches, susceptible to many diseases and insects
<i>Ailanthus altissima</i>	Tree of Heaven	Invasive, heavy seeding and sprouting, weak wood
<i>Albizia julibrissin</i>	Mimosa, Silk Tree	Invasive, spreads by seed
<i>Betula papyrifera</i>	Paper Birch	Short-lived, prone to birch borers & leaf miners
<i>Betula pendula</i>	European White Birch	Short-lived, prone to birch borers & leaf miners
<i>Eleagnus angustifolium</i> , <i>E. umbellata</i>	Russian Olive, Autumn Olive (shrub)	Invasive, Spreads by seed
<i>Fraxinus</i> spp.	Ash	Susceptible to borers
<i>Ginkgo biloba</i> (female)	Female Ginkgo	Rancid smelling fruit
<i>Gleditsia triacanthos</i>	Thorny Honeylocust	Thorns
<i>Juglans nigra</i>	Black Walnut	Toxins inhibit other plant growth, messy fruit
<i>Maclura pomifera</i>	Osage Orange	Large thorns, messy fruit
<i>Morus</i> spp.	Mulberry	Heavy sprouting, weak wood, messy fruit
<i>Paulownia tomentosa</i>	Princess Tree	Invasive, spreads by seed
<i>Populus</i> spp.	Poplar	Short-lived, prone to canker disease
<i>Prunus serotina</i> , <i>P. avium</i> , <i>P. cerasus</i>	Cherry	Invasive, <i>P. serotina</i> has messy fruit
<i>Pyrus calleryana</i>	Bradford Pear, Callery Pear	Invasive, spreads by seed
<i>Quercus alba</i>	White Oak	Susceptible to gypsy moth
<i>Sorbus</i> spp.	Mountain Ash	Susceptible to many diseases and insect pests
<i>Ulmus pumila</i>	Siberian Elm	Invasive
Shrubs		
<i>Berberis thunbergii</i>	Japanese Barberry	Invasive, spreads by seed
<i>Euonymus alatus</i>	Burning Bush, Winged Euonymus	Invasive, spreads by seed and resprouting of roots
<i>Ligustrum</i> spp.	Privet	Invasive, spreads by seed
<i>Lonicera</i> spp.	Bush Honeysuckles	Invasive, out-compete natives
<i>Rosa multiflora</i>	Multiflora Rose	Invasive, spreads by seed and resprouting roots

Table VI – Plantings Not Recommended for General Use - Continued

Botanical Name	Common Name	Comments
Vines		
Ampelopsis brevipedunculata	Porcelain Berry	Invasive, spreads by seed
Celastrus orbiculatus	Oriental Bittersweet	Invasive, spreads by seed
Euonymus fortunei	Wintercreeper	Invasive by spreading
Hedra helix	English Ivy	Invasive by spreading, can spread by fruit, girdles shrubs and trees
Lonicera japonica	Japanese Honeysuckle	Invasive, spreads by seed, girdles shrubs and trees
Pueraria lobata	Kudzu	Invasive by spreading rapidly, girdles shrubs and trees
Vinca minor	Periwinkle	Invasive by spreading
Wisteria sinensis, W. floribunda	Chinese and Japanese Wisteria	Invasive, spreads by seed and resprouting roots, girdles shrubs and trees

Table VII – On-Site Residential Planting Requirements Outside of the Critical Area

Residential Type and Lot Size	Minimum Number of Shade Trees ¹	Minimum Number of Minor Shade Trees, Ornamental Trees, or Evergreen Trees ²
Single Family Detached Lots One Acre or Larger	4 per lot	3 per lot
Single Family Detached Lots 20,000 sq.ft. – 39,999 sq.ft.	3 per lot	2 per lot
Single Family Detached Lots 5,000 sq.ft. – 19,999 sq.ft.	1 per lot	1 per lot

Notes

1. Shrub and ground plane plantings to cover 25% of the entire site. Refer to Table V Shrubs for recommended shrub plantings. Refer to Table VIII General References for recommended native ground plane plantings.

2. Preserved trees that are located within the lot and that are comparable in size and are in good health, as determined by the City Arborist, may be counted on a one-to-one basis toward the above requirements.

Table VIII –References and Advisory Lists

General

- Anne Arundel Landscape Manual. *Native Plants for Anne Arundel County, Maryland*. <http://www.aacounty.org/IP/Resources/AANativePlants.pdf>
- Burell, Colston C., 2006. *Native Alternatives to Invasive Plants*. Brooklyn Botanical Gardens All-Region Guides 1000 Washington Ave., Brooklyn, NY.
- Dirr, M.A. 1998. *Manual of woody landscape plants: their identification, ornamental characteristics, culture, propagation and uses*. 5th Ed. Stipes Publ. Co., Champaign IL.
- The Pennsylvania State University 2001. *Landscape Tree Factsheets: Including Evergreens for Screens*. 3rd Ed. Publications Distribution Center, The Pennsylvania State University, 112 Agriculture Administration Building, University Park, Pa.
- U.S. Fish and Wildlife Service. *Native Plants for Wildlife Habitat and Conservation Landscaping: Chesapeake Bay Watershed*. <http://www.nps.gov/plants/pubs/chesapeake/>

Stormwater Management

- Prince George's County, Maryland, Dept. of Environmental Resources, Environmental Services Division. Dec. 2007. *Bioretention Manual*. http://www.princegeorgescountymd.gov/sites/DPIE/Resources/Publications/related/Documents/PGDER_OperationAndMaintenanceForBioretention_12.13.14.pdf
- State of Maryland, Dept. of the Environment. Oct. 2000, Revised May 2009. *Maryland Stormwater Design Manual Vol. 1 & 2*. http://mde.maryland.gov/programs/Water/StormwaterManagementProgram/MarylandStormwaterDesignManual/Pages/Programs/WaterPrograms/SedimentandStormwater/stormwater_design/index.aspx
- Thornhurst, Gwendolyn A. *Wetland Planting Guide for the Northeastern United States. Plants for Wetland Creation, Restoration, and Enhancement*. Environmental Concerns, Inc. St. Michael's Maryland, 1993.
- U.S. Fish and Wildlife Service. *Native Plants for Wildlife Habitat and Conservation Landscaping: Chesapeake Bay Watershed*. <http://www.nps.gov/plants/pubs/chesapeake/>

Invasives

- Burell, Colston C., 2006. *Native Alternatives to Invasive Plants*. Brooklyn Botanical Gardens All-Region Guides 1000 Washington Ave., Brooklyn, NY.
- Invasive Species of Concern in Maryland: Terrestrial Plants. http://www.mdinvasivesp.org/list_terrestrial_plants.html
- Maryland Native Plant Society. *Control of Invasive Non-Native Plants: A Guide for Maryland Gardeners and Homeowners in the Mid-Atlantic Region*. <http://www.mdflora.org/aboutinvasives.html>
- Swearingen, J., K. Reshetiloff, B. Slattery, and S. Zwicker. 2002. *Plant Invaders of Mid-Atlantic Natural Areas*. National Park Service and U.S. Fish & Wildlife Service, Washington, D.D. 82 pp. or <http://www.nps.gov/plants/alien/pubs/midatlantic/>

Appendix B: Possible Permits and Applications

This list includes the possible forms, permits, licenses and applications that may be necessary for the site plan production process or other phases of the approval process. Check with the overseeing department to determine which permits or applications are applicable to the project. Refer to *Forms, Permits and Licenses* on the City's website - <http://www.annapolis.gov/government/forms-permits-and-licenses> to download forms (most are available as downloads, some can be submitted on line).

Neighborhood and Environmental Programs

410-263-7946

Informational Brochures

- Deck brochure
- Mini Guide for Obtaining Permits and Inspections
- Plan Requirements- Non-Residential Buildings
- Pre-application meetings
- Residential Building Permit Plan Requirements
- Shed - Accessory Building Requirements

Applications and Permits

- Building Permit Application
- Commercial Building Permit Application
- Demolition Permit Application
- Fence Permit Application
- Grading Permit Application and Stormwater Management Information - Contact DNEP
- Port Wardens Application
- Sign Permit Application
- Standard Erosion and Sediment Control Plan Application
- Stormwater Management Credit Application for Commercial Industrial and Exempt Properties
- Stormwater Management Credit Application for Residential
- Tree Permit
- Tree Regulation in the City of Annapolis

Planning and Zoning Department

410-263-7961

- Adequate Public Facilities Certificate Application
- Administrative Adjustment Application
- Administrative Interpretation Application
- Appeal of an Administrative Decision to the Board of Appeals Application
- Critical Area Buffer Management Plan
- Critical Area Lot Coverage Worksheet
- Critical Area Simplified Buffer Management Plan

- Historic Preservation Commission Administrative Approval Application and Guidelines
- Historic Preservation Commission Public Hearing Application and Guidelines
- Historic Preservation Commission Tax Credit Application
- Landscape Maintenance Agreement
- Moderately Priced Dwelling Unit MPDU Agreement to Build
- Moderately Priced Dwelling Unit MPDU Application
- Moderately Priced Dwelling Unit MPDU Declaration of Covenants
- Moderately Priced Dwelling Unit MPDU Sales Offering Agreement
- Planned Development Application
- Site Design Plan Review Application
- Special Exception Application
- Subdivision Application
- Variance Application
- Zoning District Boundary Adjustment Application
- Zoning Map Amendment Application (Local)

Public Works

410-263-7949

- Street and or Sidewalk Opening Permit
- Sidewalk Permit Application
- Curb Cut Permit

Webpage URLs

Bioretention, Microbioretention and Rain Gardens

¹<http://www.mde.state.md.us/assets/document/Design%20Manual%20Chapter%205%2003%2024%202009.pdf>

² <http://www.aacounty.org/DPW/Highways/RainGarden.cfm>

³http://www.princegeorgescountymd.gov/sites/DPIE/Resources/Publications/related/Documents/PGDER_OperationAndMaintenanceForBioretention_12.13.14.pdf

Regenerative Stormwater Conveyance

⁴ <http://www.mde.state.md.us/>

⁵ <http://www.aacounty.org/DPW/Watershed/StepPoolStormConveyance.cfm>

⁶ <http://www.stormwatercenter.net>

Green Roofs

⁷<http://www.mde.state.md.us/assets/document/Design%20Manual%20Chapter%205%2003%2024%202009.pdf>

⁸ http://www.mde.state.md.us/assets/document/sedimentstormwater/Appnd_A.pdf

⁹<http://www.mde.state.md.us/assets/document/Design%20Manual%20Appendix%20B4%2001%202009.pdf>

¹⁰ http://www.astm.org/SNEWS/JULY_2007/roof_jul07.html

Permeable Paving

¹¹<http://www.mde.state.md.us/assets/document/Design%20Manual%20Chapter%205%2003%2024%202009.pdf>

¹²<http://www.mde.state.md.us/assets/document/Design%20Manual%20Appendix%20B4%2001%202009.pdf>

¹³ <http://www.stormwatercenter.net/>

Vegetated Swales

¹⁴<http://www.mde.maryland.gov/assets/document/Design%20Manual%20Chapter%205%2003%2024%202009.pdf>

¹⁵http://mde.maryland.gov/programs/Water/StormwaterManagementProgram/MarylandStormwaterDesignManual/Documents/www.mde.state.md.us/assets/document/sedimentstormwater/Appnd_A.pdf

¹⁶<http://mde.maryland.gov/programs/Water/StormwaterManagementProgram/MarylandStormwaterDesignManual/Documents/www.mde.state.md.us/assets/document/appendixb3.pdf>

Detention and Retention Ponds

¹⁷<http://www.mde.state.md.us/assets/document/Design%20Manual%20Chapter%205%2003%2024%202009.pdf>

¹⁸<http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/SedimentandStormwaterHome/Pages/Programs/WaterPrograms/sedimentandstormwater/ho>

me/index.aspx

¹⁹ http://www.mde.state.md.us/assets/document/sedimentstormwater/Appnd_A.pdf

²⁰ <http://www.mde.state.md.us/programs/waterprograms/sedimentandstormwater/erosion/sedimentcontrol/standards.asp>

Technical and Aesthetic Grading

²¹ <http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/SedimentandStormwaterHome/Pages/Programs/WaterPrograms/sedimentandstormwater/home/index.aspx>

Sediment and Erosion Control

²² <http://www.annapolis.gov/government/city-departments/neighborhood-environmental/stormwater-management>

²³ <http://www.annapolis.gov/docs/default-source/forms-permits-and-licenses/standard-erosion-and-sediment-control-plan-application.pdf>

Steep Slope Stabilization

²⁴ <http://www.dsd.state.md.us/comar/comar.aspx>.

Living Shorelines

²⁵ ftp://ftpfc.sc.egov.usda.gov/MD/web_documents/programs/rcd/shore_esrcd.pdf

²⁶ <http://www.mde.state.md.us/assets/document/wetlandswaterways/Shoreerostext.pdf>.

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²⁷ http://www.cwp.org/Resource_Library/Center_Docs/BSD/ELC_BSDpart1.pdf

²⁸ <http://www.usgbc.org/ShowFile.aspx?DocumentID=5546>

Bicycle Parking

²⁹ http://www.apbp.org/resource/resmgr/publications/bicycle_parking_guidelines.pdf

³⁰ https://bookstore.transportation.org/collection_detail.aspx?ID=116

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³¹ <http://www.iowadot.gov/iowabikes/trails/chpt04-3.html>

³² <http://www.fhwa.dot.gov/environment/sidewalk2/sidewalks212.htm>

³³ <http://www.hsrc.unc.edu/research/pedbike/98095/>

³⁴ <http://www.fhwa.dot.gov/environment/fspubs/07232816/index.htm>.

Crosswalks

³⁵ <http://mutcd.fhwa.dot.gov/htm/2009/part3/part3b.htm>

³⁶ <http://mutcd.fhwa.dot.gov/htm/2009/part3/part3b.htm>

³⁷ http://www.roads.maryland.gov/mmutcd/2011_Parts_02.pdf

³⁸ http://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalk2/pdf/01b_toc.pdf

Traffic Calming

³⁹ <http://mutcd.fhwa.dot.gov/htm/2009/part3/part3b.htm>

⁴⁰ <http://www.fhwa.dot.gov/environment/sidewalk2/sidewalks212.htm>

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⁴¹ http://www.mdinvasivesp.org/invasive_species_md.html

⁴² <http://www.mdflora.org/>

⁴³ <http://www.nurserycropscience.info/cultural-practices/pruning/other-references/american-nursery-landscape-assoc-standards-2004.pdf/view>

Tree Planting Requirements

⁴⁴ <http://www.lcamddcva.org/about/publications.cfm>

Shrubs

⁴⁵ <http://www.lcamddcva.org/about/publications.cfm>

Groundcovers

⁴⁶ <http://www.lcamddcva.org/about/publications.cfm>

⁴⁷ <http://www.ashrae.org/technology/page/548>

⁴⁸ <http://www.usgbc.org/ShowFile.aspx?DocumentID=5546>

⁴⁹ <http://www.sustainablesites.org/report/guidelines>

Light Sources

⁵⁰ <http://docs.darksky.org/DarkSkyPlaces/MMPG.pdf>

⁵¹ http://docs.darksky.org/PR/PR_Blue_White_Light.pdf

Light Pollution

⁵² <http://www.ashrae.org/technology/page/548>

⁵³ <http://www.usgbc.org/ShowFile.aspx?DocumentID=5546>

⁵⁴ <http://www.sustainablesites.org/report/guidelines>

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⁵⁵ http://www.annapolis.gov/upload/images/government/boards/hist_pres/designManual.pdf

⁵⁶ <http://www.usgbc.org/ShowFile.aspx?DocumentID=5546>

⁵⁷ <http://www.sustainablesites.org/report/>

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⁵⁸ <http://www.annapolis.gov/docs/default-source/planning-and-zoning-documents/historic-district-design-manual.pdf?sfvrsn=4>